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# The Far Eastern Review

ENGINEERING + FINANCE + COMMERCE

THE PIONEER IN ITS FIELD

*A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and Advancement of Trade in Far Eastern Countries.*

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## Red Cross Roads in North China

WITH a record of 856 miles of new roads built and 3,572 wells dug, the work of the American Red Cross in North China came to an end on August 10th. Faced with the problem of transporting food over vast stretches of roadless territory to villages and communities whose inhabitants were facing death by starvation, the directors of the Red Cross Society decided that the best way to alleviate the suffering and at the same time provide work for the unfortunates was to concentrate upon opening up new roads through these districts. In the face of great difficulties the work has been carried through to a point where the people have been provided for until the next harvest. There are many phases of this great work which deserve special notice and which is treated fully in the official Red Cross publications. Manufacturers of road machinery, however, will be interested in learning that the above work was carried through with shovel, pick, wheelbarrow and stone rollers all of local manufacture. No modern machinery was employed, no iron culverts used. In fact, steam road rollers can be employed successfully only on certain long level stretches in north China. As a market for foreign materials, road making in China reduces itself to one for automobiles and possibly carts, or board tired American wheels. The use of automobiles and autobuses is the one direct benefit to foreign manufacturers arising from these new roads, and already one enterprising Chinese company is operating an autobus service out from Taming-fu with four large machines carrying about 15 passengers each trip. The charge is \$6.00 (Mexican) for a twenty-mile trip, or three times the charge for cart traffic.

The busses are always filled, indicating that the Chinese merchant recognizes the value of time saved and is willing to pay for it. It is expected that similar autobus lines will be established at the more populous centres along these roads. Perhaps the most commercially important of the roads completed by the American Red Cross is the one in Shansi province which leaves the provincial highway at Pingyaohsien and passing through the large city of Fenchow, terminates at Jung-Tu, on the Yellow River, thus

providing a water outlet to this immensely wealthy district. The Chinese authorities intend to develop the little village into an up-to-date river port. Another road which opens up great commercial possibilities is the one in the eastern part of Shansi running south from Pingtingchow into the iron, coal and pottery districts. Mr. Baker, the director of the Red Cross operations in China, is enthusiastic over the work in this province, and says that the Pingtingchow road has brought prosperity to the whole community, the potters and blacksmiths were given a new lease of life. Vitriified clay pipes were made for drains by the potters at an exceptionally low cost, while the iron workers turned out shovels, picks, hammers and other tools required in road construction.

The greatest difficulty confronting the maintenance of these new roads lies in the use of the narrow, one and a half inch tires, which quickly destroy even the best of metalled surfaces. In addition, the real swagger Chinese cart wheel is serrated like a narrow cog wheel and when it gets busy on a new road the result is heartbreaking to the maintenance engineer. The Red Cross has sold about a hundred sets of broad tired wheels in addition has sent into Shansi a large amount of iron to be made into tires. The Chinese authorities in the first flush of the benefits arising from these new highways are showing a deep interest in their maintenance and a desire to extend the system as fast as they can. Tolls are collected for this purpose, and although present indications tend to prove that these revenues are being expended for road improvement, it is almost hopeless to look for prolonged civic righteousness under existing conditions.

The road work has provided many opportunities for careful studies into basic construction costs

that will prove of great value in other development work in China. Mr. Baker's tabulation of labor and other costs would seem to indicate that past methods of earthwork construction on Chinese railways are unduly and excessively high, due largely to the practice of using Chinese contractors who pay the workers the current wage and amass huge profits. As an instance of basic costs, he invites attention to the costs of the Shantung



Mr. J. E. Baker

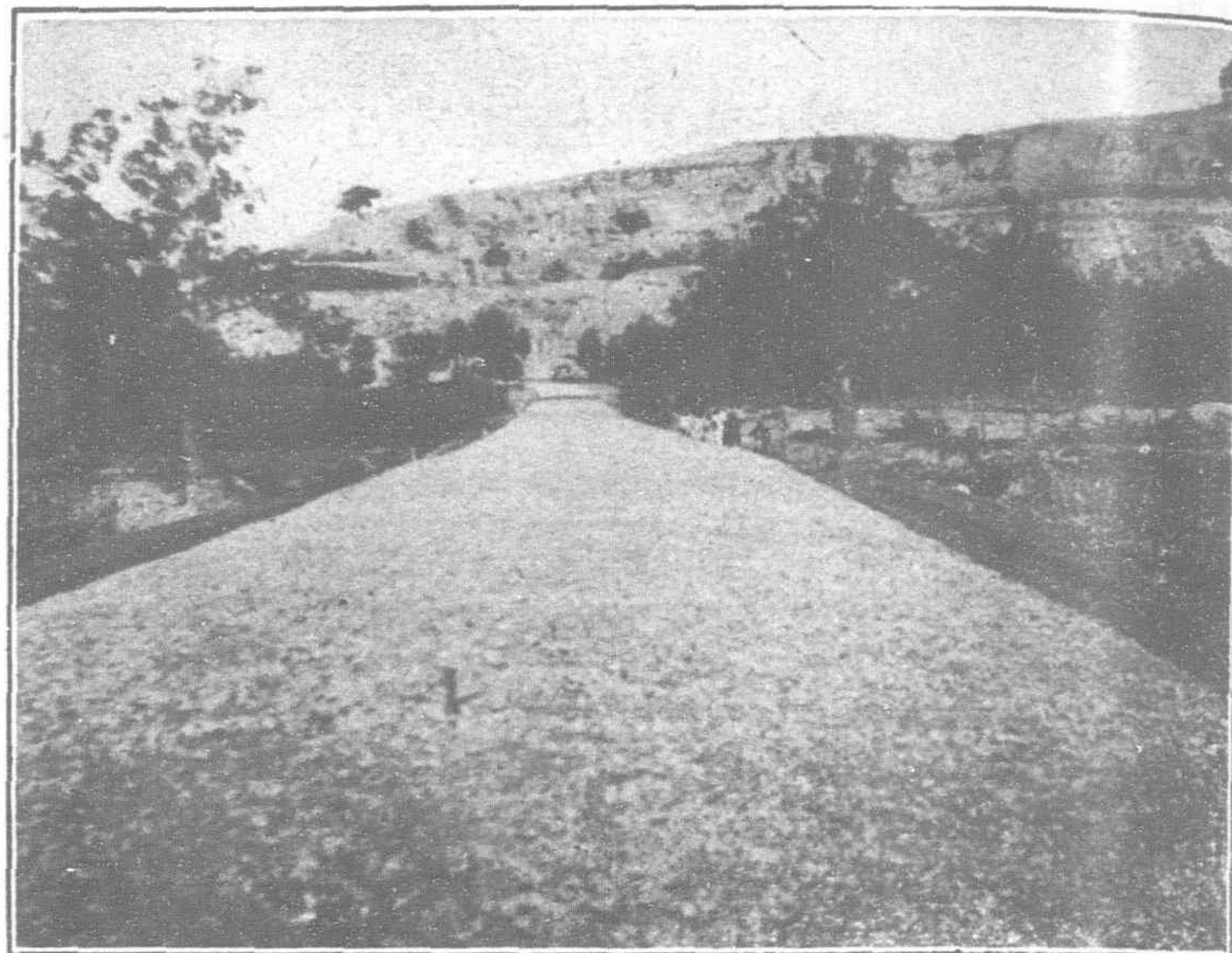
Adviser to the Chinese Ministry of Communications and Director of the American Red Cross, China Famine Relief. Under his direction over 800 miles of roads have been built in North China



## SECTIONS OF THE COMPLETED ROAD

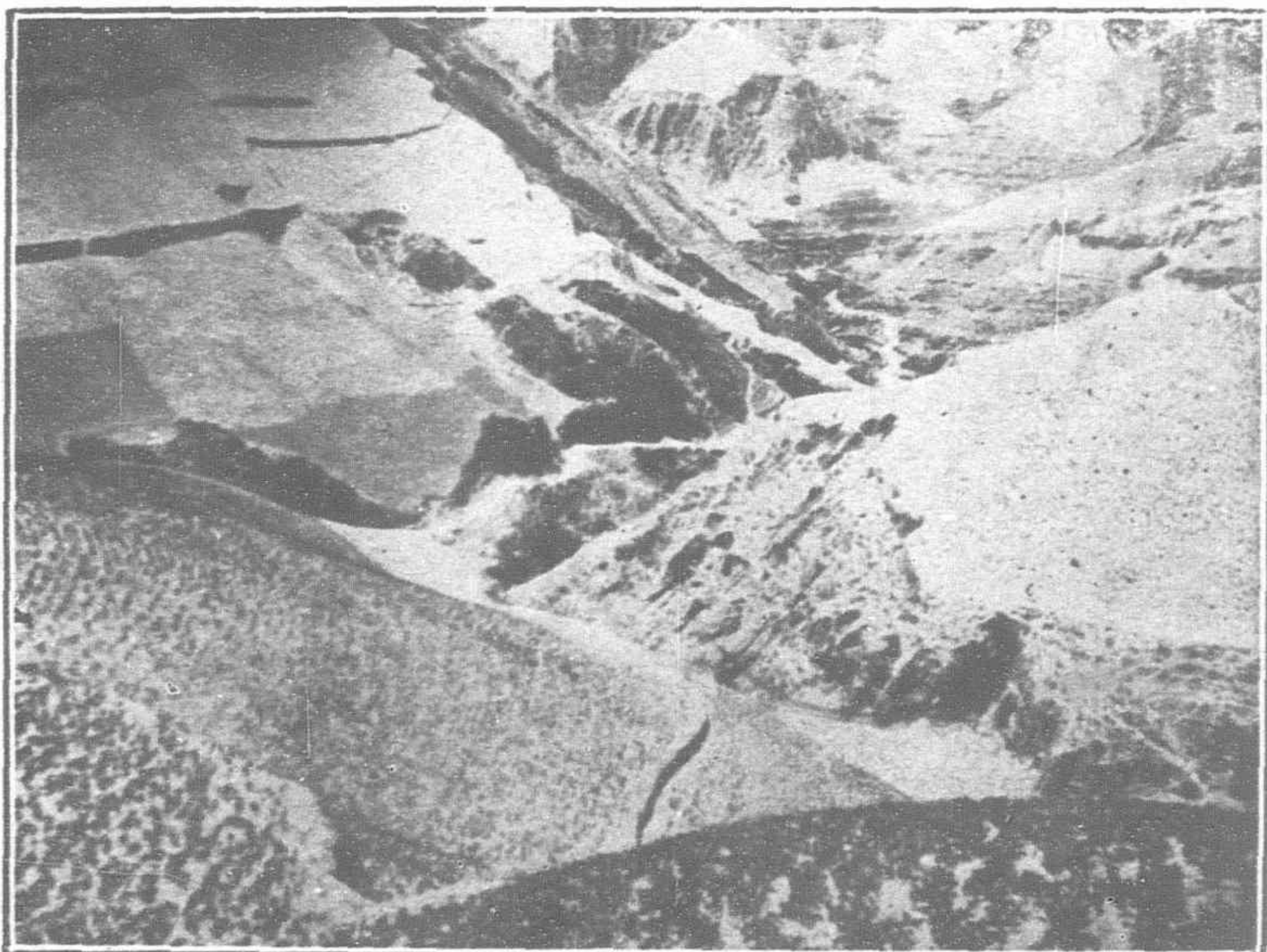


Entering Mut-Sun



Approaching the Village of Yu Chu Tsun

## THROUGH THE LOESS HILLS

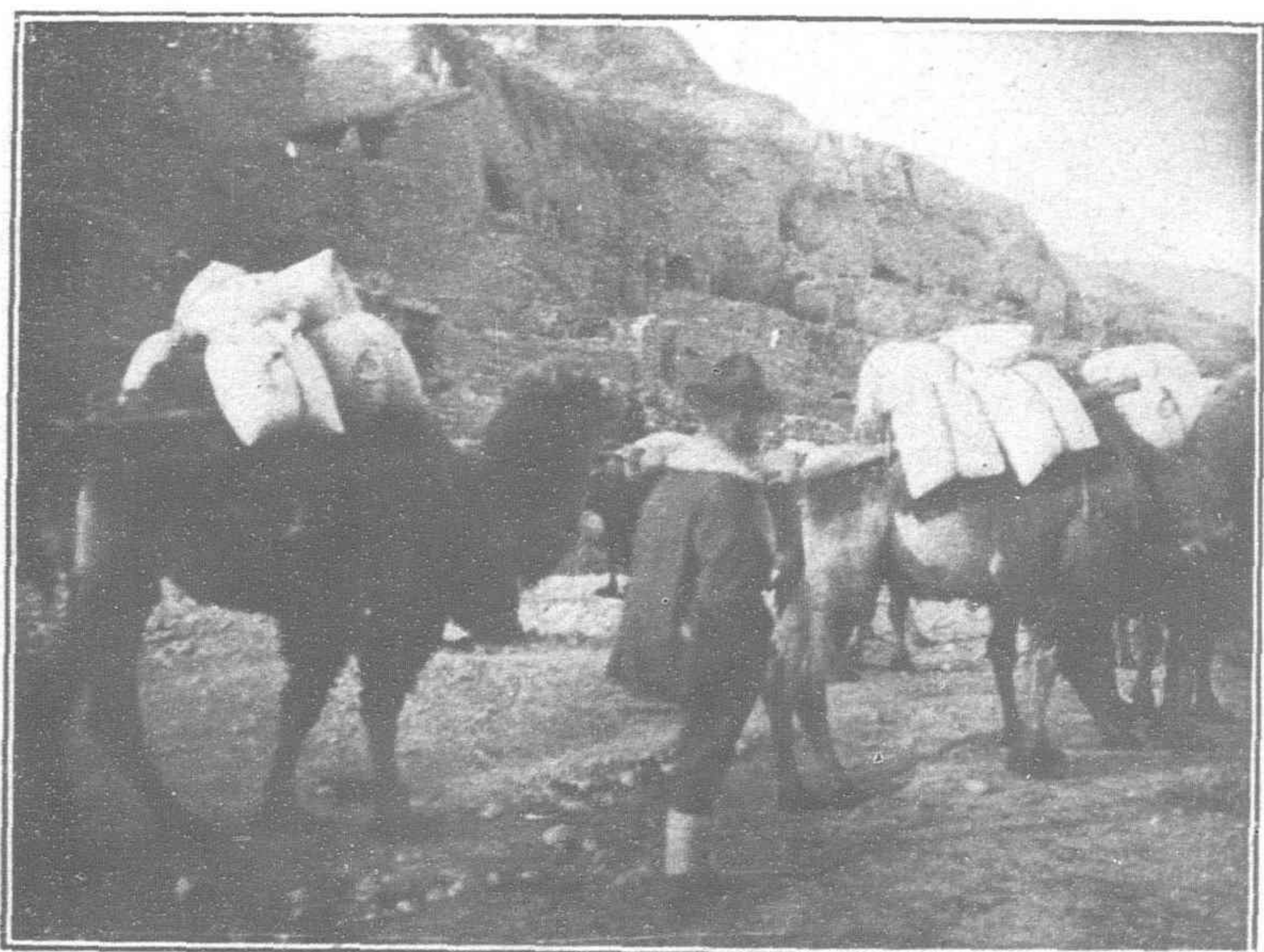


Looking down to the Valley towards Jung Tu from top of the Pass (Le Ja Wan)

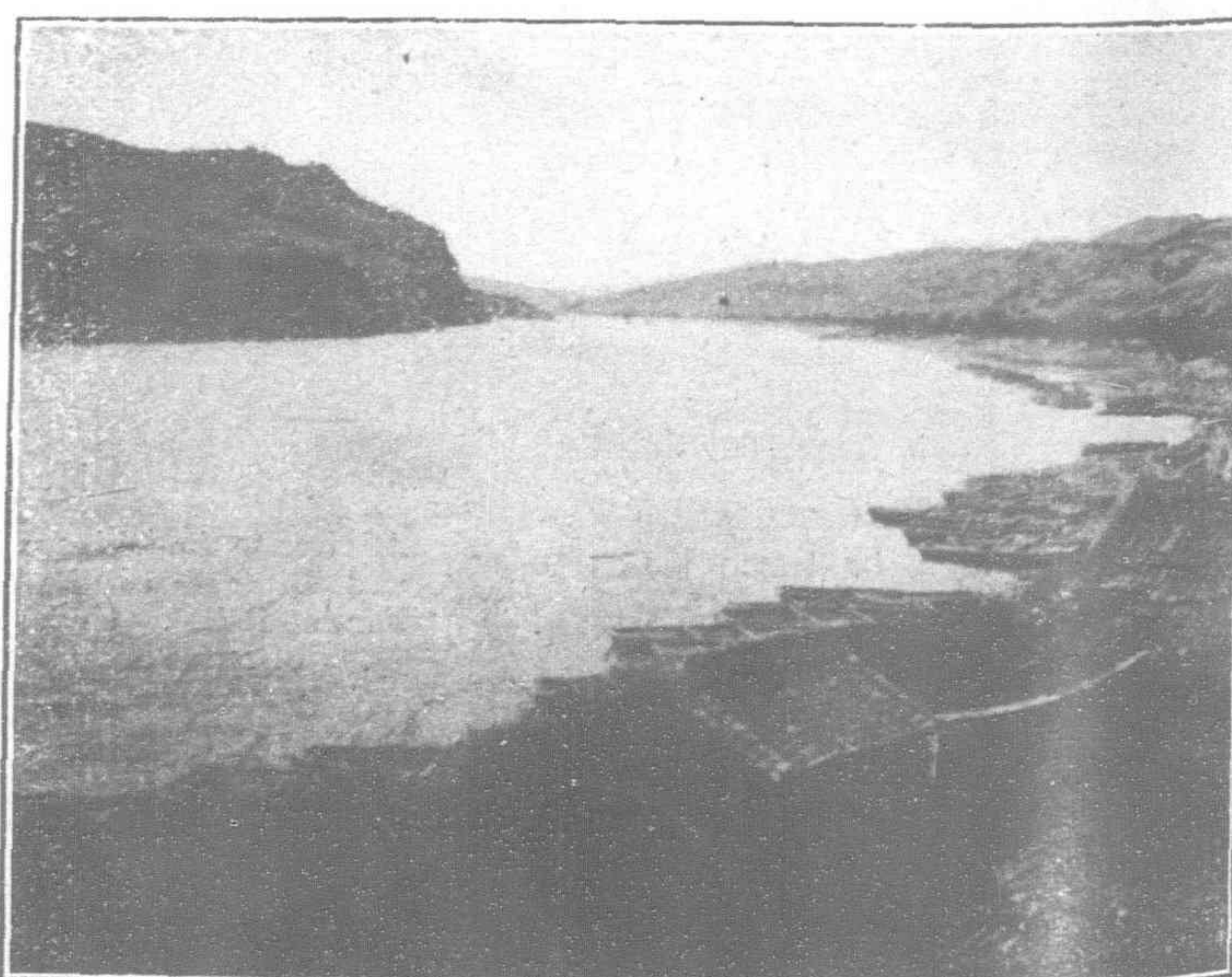


Looking down towards Jung Tu from the old Trail

## TRANSPORTATION MEDIUMS



Camel Teams near Wah Chang



Looking North up the Yellow River at Jung Tu, the finish of the Red Cross Road



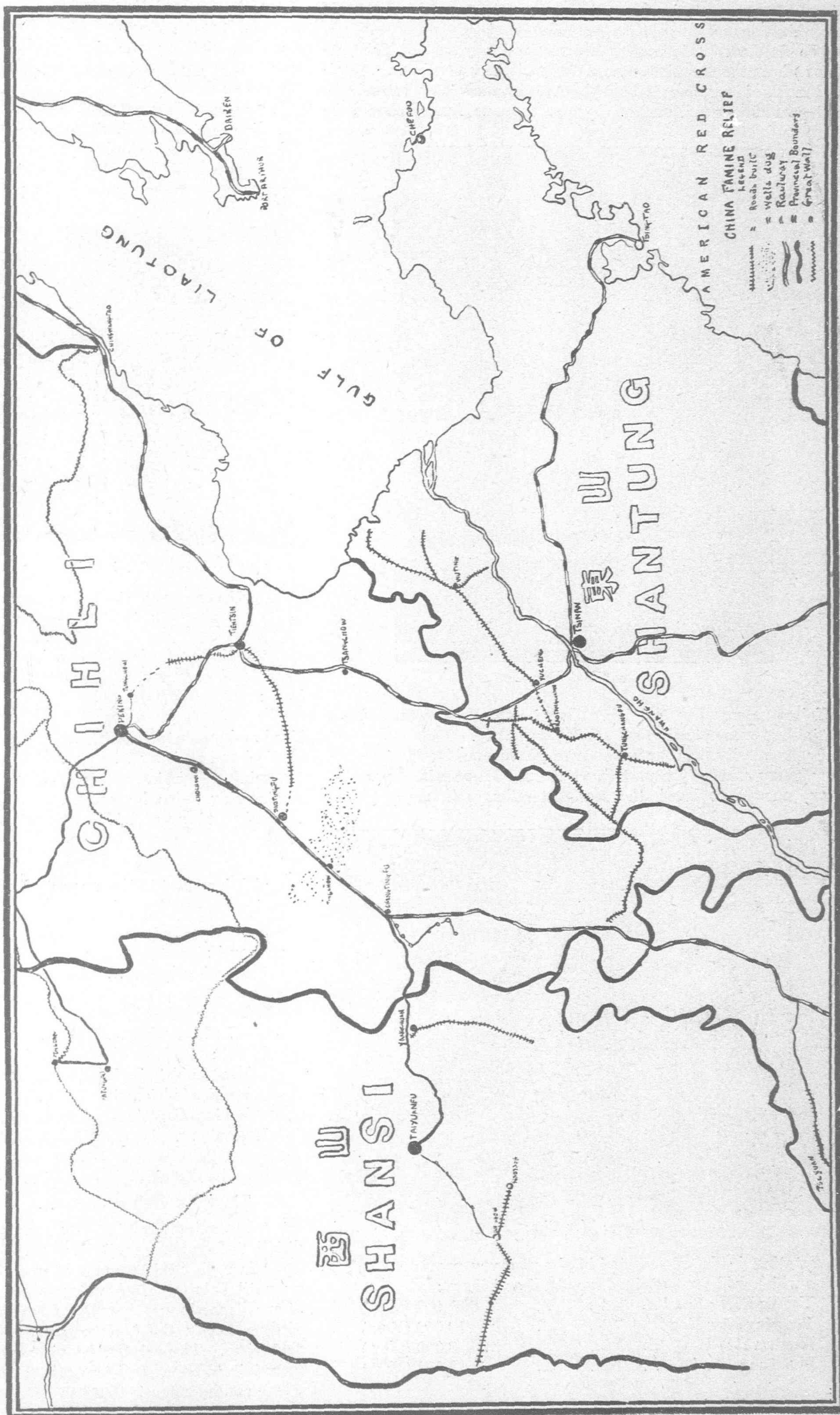
roads, \$1,719 per mile, which includes supervision, engineering, medical attention, etc., as against a cost of \$1,333 per mile for the earth-work of the Tao-ching railway constructed fifteen years ago when labor and food costs were half what they were last winter. That part of Mr. Baker's report dealing with costs is still uncompleted, but in due time, it will be made public.

In concluding his last report, Mr. Baker gives a very interesting summary of the work done up to August 10th. The following extracts will give a comprehensive idea of the great work which he has so successfully brought to a happy conclusion:—

"The American Red Cross support of the Tientsin-Peking highway operation closed on July 31st, the appropriation having been exhausted. However, an organization known as the Peking-Tientsin highway commission has secured a gift of \$50,000 (Mex.) from the American advisory committee and the work will proceed under the direction of the same personnel and the same form of organization as that employed by the American Red Cross.

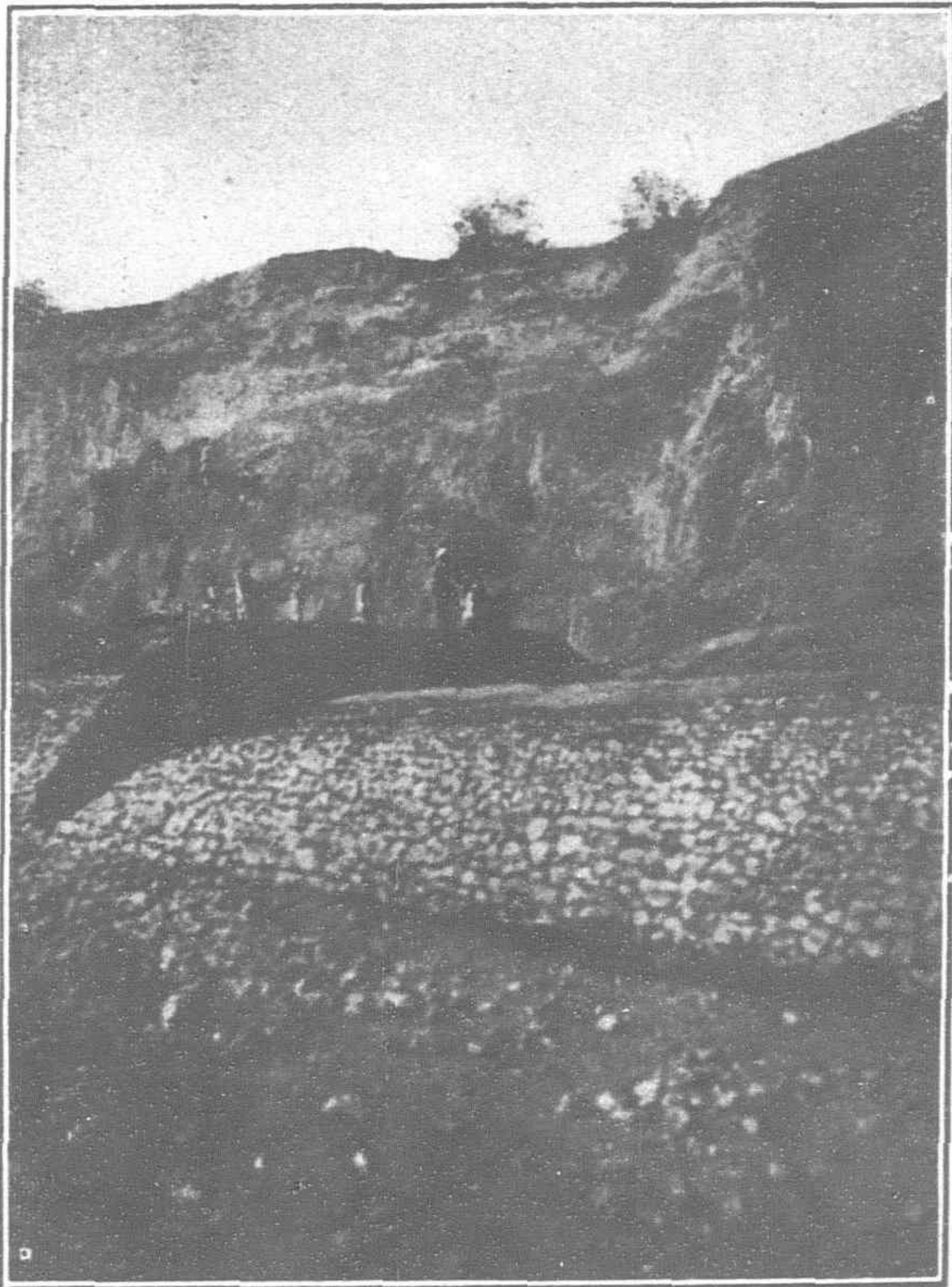
"The Honan operations were discontinued on July 31st with the work completely done except for four miles, for which macadam could not be secured due to the impassibility of connecting roads. This work will be completed during the autumn by other funds in the hands of the individuals composing the American Red Cross organization at that point.

"The Shansi operations are not complete and the balances remaining under the appropriations have been placed in the hands of the local organization. The Yellow River Road is con-



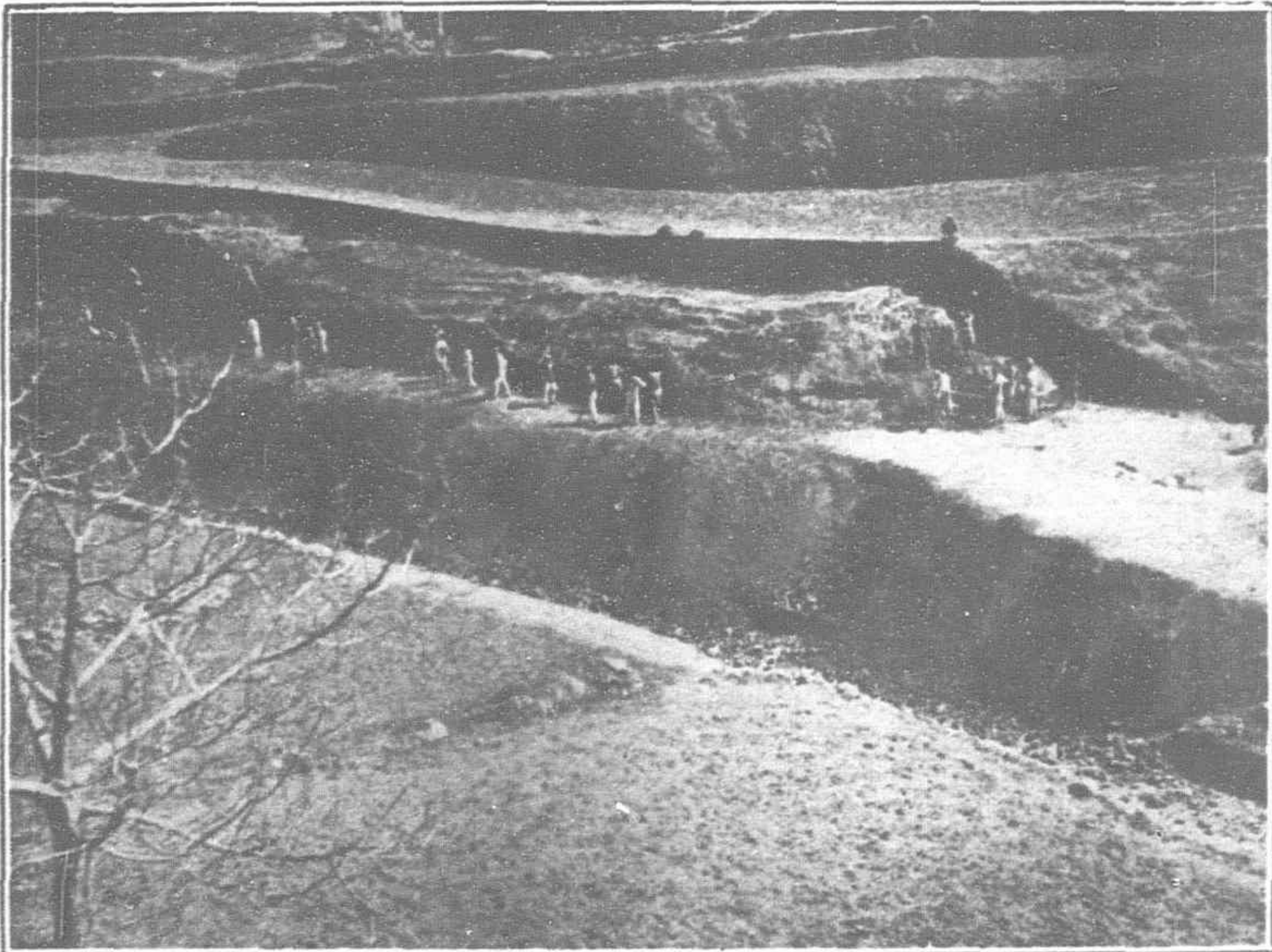


sidered 75 per cent. complete. There remain some seven miles of rock blasting and a considerable number of bridges and culverts yet to be finished. This project has received a grant of \$150,000 (Mex.) from the Shansi Famine Relief Society, which in turn received much of its resources from the American advisory committee. This amount, supplemented by our revenue funds, should be



Road Building

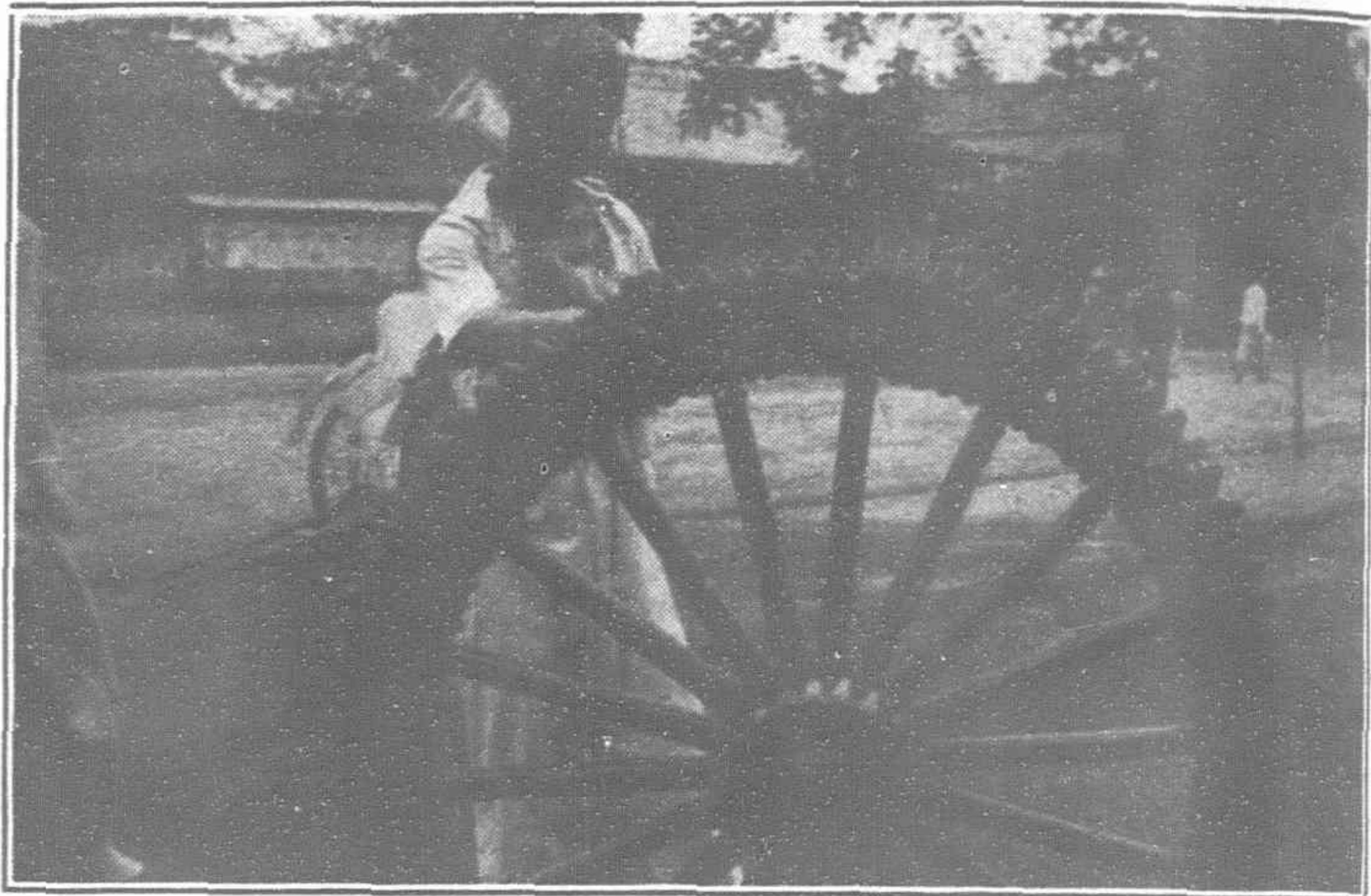
sufficient to complete this job. The Pingtingchow operation can be finished economically with the funds in hand.  
 “Practically all of our roads have suffered considerably from the very heavy rains of the past three weeks. These rains have been heavy enough to break the seasoned railways in many places.



Above War Chur

Devastating floods are reported in almost every province. The losses which we have sustained are about as follows :				
Yellow River Road ...	...	...	...	\$65,000 (Mex.)
Pingtingchow Road...	...	...	...	10,000 (Mex.)
Hantan Road	...	...	...	8,000 (Mex.)
Shantung Road	...	...	...	2,000 (Mex.)
Total	...	...	...	\$85,000 (Mex.)

“Not all of this is unfortunate as in the two Shansi projects it gave the engineers the exact data which they needed to work upon in making the slight re-location and revision of culvert sites. On the Pingtingchow road, it is now clearly shown that about two miles were located below the high flood level.  
 “Summarizing the work which has been accomplished under the direction of the American Red Cross, China Famine Relief, reference is made to the July report showing approximately 145,000 workmen recruited and 841,000 persons reached by relief. These figures are not to be altered by the period which has elapsed since.



A Chinese Road Devil

The saw tooth wheel of a swagger Peking Cart, the “bete noir” of the modern road maker

“In this work of relief there has been expended (in round numbers) local currency \$2,428,000, This total is distributed as follows :

	Amount	Per Cent.
Food and wages to workmen...	\$2,025,000	83
Medical and sanitary ...	25,500	4
Commissary, salaries, quarters, etc ...	92,500	1
Engineering, autos, horses, etc. ...	181,000	8
General (Peking and field headquarters) ...	104,000	4
	\$2,428,000	100

“With respect to the amount of construction produced by this organization, the following summary is given :—

Shantung ...	...	485 miles (50,000 trees planted also)
Shansi :		
Pingtingchow ...	78	,, (will be completed with American Red Cross funds)
Yellow River Road and branches ...	123	,, (75% complete)
Chihli :		
Hantan-Taimingfu	46	,,
Paotingfu-Tientsin	75	,,
Peking-Tientsin ...	12	,, (in unconnected sections)
Honan ...	37	,, (All macadamized except for four miles)
Total	856 miles	

Tingchow Well project ... 3,572 wells completed

“Approximately 15,000 tons of grain have been purchased and distributed on these projects.

“In gaging this amount of work it must be remembered that up until February 19th we were not aware that we should have at our disposal more than \$500,000 (Gold), plus a few miscellaneous pledges. Only the Shantung operation had been organized at that time. Two of the heaviest projects are through difficult mountain territory and two others are in regions subject to flood where careful attention had to be given to drainage. Conception, organization, survey, provisioning and executing of the work has



been thrust into this limited compass of time. The quality of some of the work and the expense of considerable of it have been sacrificed, of course, in order to make employment available in time for it to be of service.

In view of this condition, it may be worth while to consider the final approximate costs :

Operation	Miles	Expenditure (Local Currency)	
		Total Dollars	Per Mile Dollars
Shantung ... ..	485	834,000.00	1,719.00
Hantan ... ..	46	115,000.00	2,500.00
Pingtingchow ... ..	78	500,000.00	6,410.00
Ping Yao ... ..	21	25,000.00	1,200.00
Honan ... ..	37	70,000.00	1,880.00
(Thirty-three miles macadamized)			
Tientsin-Peking ... ..	12	50,000.00	4,166.00
Paotingfu-Tientsin ... ..	75	5,400.00	600.00
(Repair work only)			
Tingchow Wells ... ..	3,572 wells	\$27.19 Per well	
(Red Cross portion only)			

"In the past considerable has been said concerning the inefficiency of famine labor. Certain comparisons which are now possible are valuable on this point. Take the Shantung operation for example,—the cost figure is \$1,719 (Mex.) per mile. These costs include supervision, engineering and medical service as well as actual payment to laborers. The most economically constructed railroad in China, the Taokow-Chinghua shown a cost of \$1,333 per mile of line for the earthwork alone. This was constructed some fifteen years ago when the costs of labor and food for labor were less than one-half of the costs during the past winter. In addition it must be remembered that the American Red Cross deliberately carried on work during the winter months when frost made efficiency impossible, in order to keep up the relief phases of the work.

"If one may judge from current expressions of opinion, future attempts at relief of distress in China will take the form of employment upon works of public improvement much more generally than in the past. Hence a comprehensive report covering the methods followed, forms used, prices paid, etc., in our various operations is being prepared with the hope that it may be of service when future relief is required."

## Tin Mining in Malaya

### Shrinkage of Exports from Federated Malay States

LAST year's export of tin from the Federated Malay States amounted to 34,935 tons, valued at £10,316,737, compared with 36,935 tons in 1919, valued at £8,736,474. In 1918 the exports amounted to 37,370 tons. In his annual report Mr. A. R. Mynott, A.R.S.M., acting senior warden of mines, F.M.S., states that at the opening of the year the price of tin on the local market was \$167.50 per picul, with the market rising. The rise continued rapidly until at the end of February the unprecedented high price of \$212 was reached. Thereafter a reaction set in until, at the beginning of December, it stood at \$90 per picul. The position at that time became so critical that to save a large number of the mines from closing down, and the consequent dislocation of labor that would ensue, the government decided to purchase. From December 14 the government were purchasing at \$110 per picul, which price was raised on December 21 to \$115, and that was the position at the close of the year. The fluctuation was \$122 in the year under review as compared with \$66 in 1919. The extraordinary rapid rise in the price at the beginning of the year was due chiefly to the operations of speculators, and the reckless buying was, no doubt, due to the erroneous deductions that a falling off in production was anticipated with consequent reduction of supplies, that the central European powers would be in a position to assimilate amounts approximating their pre-war requirements, and that consumption in the United Kingdom and America would increase. The slump at the end of the year was due to a variety of causes, chief amongst which was the reduced consumption demand, the unexpected unloading of stocks of Dutch tin on the London market, liquidation of large stocks of Chinese tin which had been held up in Chinese ports owing to the high price of silver at the beginning of 1920, the disorganization of the Welsh tinplate industry towards the end of the year, the instability of exchange, and the general labor unrest. The outlook at the end of the year was not encouraging, general conditions were bad, and no improvement in the market could be anticipated.

The table below shows actual export of production in each state for the last three years :—

	1918.	1919.	1920.
Perak ... (Piculs)	387,750	371,722	371,848
Selangor ... ..	170,359	178,608	148,715
Negri Sembilan ... ..	16,246	14,761	11,710
Pahang ... ..	53,460	55,427	54,632
Total ... ..	627,815	620,518	586,905

### Labor

The labor force employed on mining at the end of the year (inclusive of individual licences, but exclusive of holders of dulang

passes) was 89,557, all of whom, with the exception of 610 on gold and 3,000 on coal, were employed on tin and tungsten mining. The numbers in 1919 were 113,107 and in 1918 144,621. The labor force is the lowest recorded for twenty-one years. There were 12,867 dulang pass holders in 1920 compared with 15,553 in 1919 and 15,774 in 1918. Duland pass holders in the three western states earned on an average \$251 per head, an increase of \$54 per head over 1919.

There were 26,096 employed under contract, 37,908 on wages, 24,941 on tribute and 612 held individual licences. The nationality of those employed was as follows : Europeans, 274 ; Chinese, 82,811 ; Indians, 4,489 ; Malays, 1,907 ; and others, 79. There was a decrease in Chinese of 22 per cent. as compared with 1919.

### Machinery

The total effective horse-power of the various mechanical plants employed on mines is estimated at 64,360 (including the gold mines at Raub and the colliery at Rawang). Plant was not so difficult to get, but was still enhanced in price. The use of gravel pumps is on the increase, and very few open-casts in Perak are now worked by old-fashioned methods. There were twenty bucket dredges operating, eighteen of them in Perak. Bucket dredges proposed and under construction amounted to thirty-two at the end of the year. It is interesting to note the change that is occurring in the fuel supply following on the mining of Malayan coal. The consumption of coal was 88,839 tons in 1919 and 102,270 tons in 1920.

### General

In his closing remarks, Mr. Mynott states that mining costs were very high at the beginning of the year, but the slump at the end of the year made it necessary for miners to consider seriously reducing the cost of production, with the result that wages were considerably reduced to, in some cases, as much as 20 to 25 per cent., and it is to be remarked to the credit of those concerned that the situation was accepted without trouble. Approximately, 64 per cent. of the mines were under Chinese management compared with 68 in 1919. In 1913 this percentage was 74. Thirty-seven sterling companies, with issued capital totaling to \$3,643,692, and thirty-three dollar companies, with an aggregate issued capital of \$13,081,250, are operating in the Federated Malay States ; and, in addition, there are four French companies, whose total capital amounts to 10,890,000 fcs.



# Ore Resources of Japan

**W**HEN Sir Harry Parkes, British minister to Japan, landed in Kagoshima in 1866 he was surprised to find a foundry in active operation, where the Japanese "without European aid, cast great cannons, shot and shell, and work a steam turning-lathe." An officer from H.M.S. *Princess Royal*, who accompanied Sir Harry ashore, describing his impressions to a friend, said: "There is certainly among these people the germ of a future greatness in the manufacturing world, and many of their works, even now, would be worthy of notice in any international exhibition." There is no need now to emphasize the fact that the forecast of that British naval officer was exceedingly accurate; Japan has taken a prominent position in the manufacturing world. Incidentally it may be mentioned that a British squadron had been actually engaged with the forts at Kagoshima three years prior to Sir Harry Parkes's visit, and doubtless some of the "great cannons, shot and shell" with which the Japanese attempted to drive off that punitive expedition were made in the very foundry which the British minister subsequently visited.

It is not the purpose of this article to give a dry statistical account of the mineral resources of Japan and of the industries associated with mining and metal working. Those who are interested in the exact amount of ore brought to the surface and the precise value of manufactured metal exported are referred at once to the very excellent reports issued periodically by British consular officials in Japan, and to the various publications bearing upon industrial development and commerce issued by the Japanese government from time to time. It is rather the intention of the writer to outline the history of mining and metallurgical industry in Japan, and to give a general idea of the mineral resources of the country and the aptitude of the people in utilizing them.

## A Wrong Impression

There was a general impression in Europe, 60 years ago, that Japan was almost an "El Dorado" land. Marco Polo appears to have been largely responsible for this idea, and many Dutch writers elaborated upon it. Portuguese and Spaniards told the same tale, and it is an interesting fact that the first Englishman to reside in Japan, Will Adams, was closely questioned by the highest personages in the land with the object of obtaining some clue as to the precise position of certain "islands of gold and silver" of which European navigators used to speak as being somewhere off the coast of Japan. Poor Will, however, was no wiser than the mariners from the Mediterranean who were endeavoring to find a north-west passage to the Indies. But when Japan was re-opened to foreign intercourse, and the "hairy barbarians" from the West saw with their own eyes that gold coins were in use, their fondest hopes seemed to be confirmed. The country was very quickly drained of its gold coinage—and Sir Rutherford Alcock, the British representative in Japan, made some very severe comment on the unscrupulous methods of some of his countrymen in this connection—and to the surprise of those who seemed to think that almost

any rice-field was a potential gold mine, there was no bullion in reserve wherewith to make new gold coins!

From the point of view of variety, it is probably correct to say that there is no country in the world which has more mineral resources than Japan. From sulphur to silver, from coal to gold, from tin to tungsten—almost every mineral known can be found in some parts of the country, though it must be confessed that in many cases the quantity and quality of the return are not such as to make exploitation an attractive commercial proposition in these days of keen competition. Yet the fact remains that Japan has a wonderful range of mineral deposits, and for centuries mining has been an established industry. Deposits of silver were found in 674 in the island of Tsushima, and a few years later gold is said to have been obtained there; but the supply of both metals was small, and there are suspicions that the yellow metal actually came from Chosen merely by way of Tsushima. Until the eighth century Japan relied mainly on Chosen for the precious metals, although some of them came from China.

## Mint Established

In the year 708 copper was found in the province of Mushashi, and the event was considered of sufficient importance to warrant commemoration in perpetuity by calling the year "Wado" (refined copper), following the custom of designating periods by employing the name of some momentous happening as an appropriate title for the era. A mint was established, gold, bronze and silver coins were struck, and for 250 years coinage continued to be issued at various mints until the supply of available copper was exhausted. For more than 600 years minting operations were suspended, and from the fact that rarely more than 20 tons of copper were used for this purpose per annum it might be inferred that mining operations in those days were small indeed. They were, but



Kune Mines, Furukawa Comei Kaisha

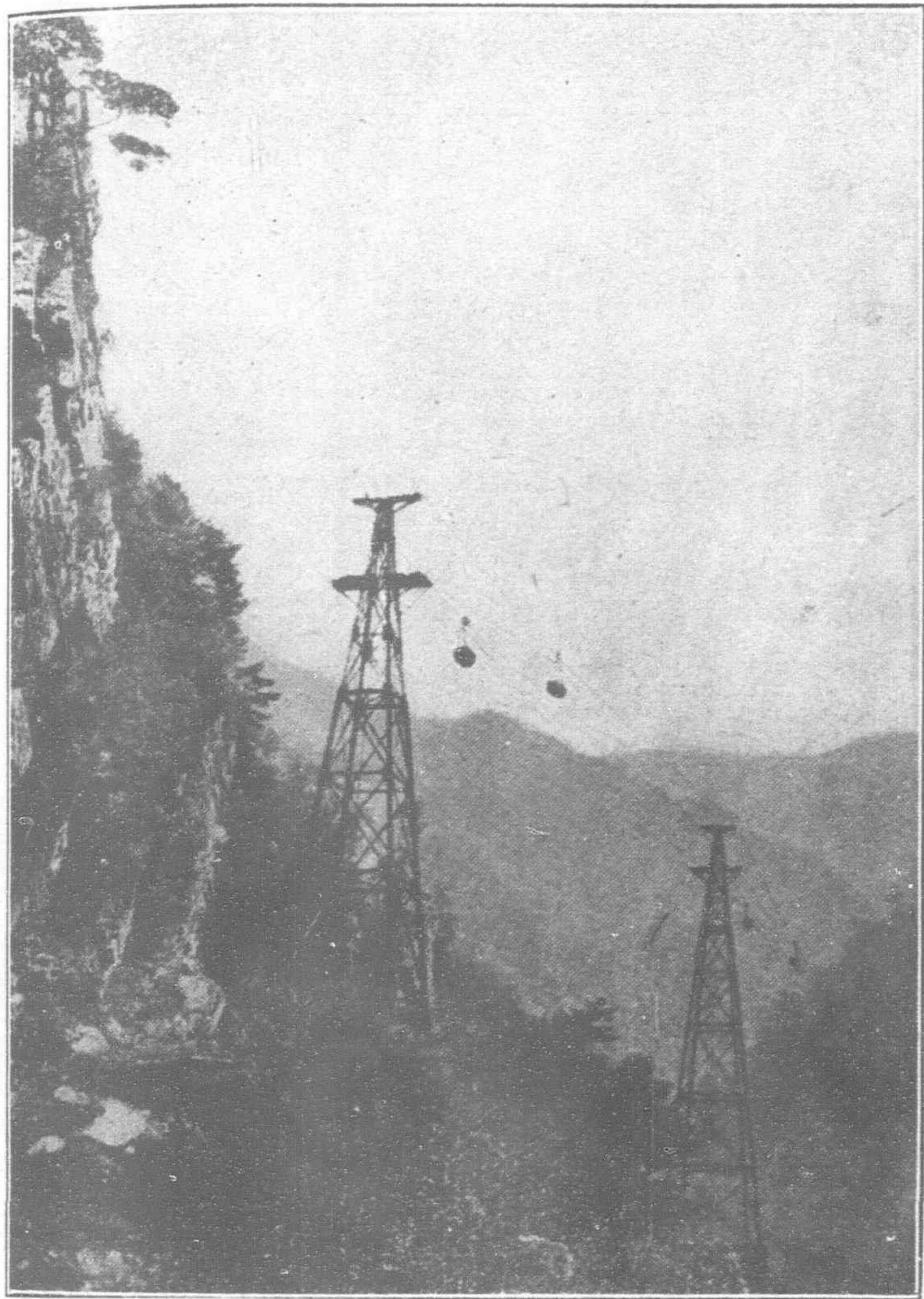
not so small that the demands of the mints could not be met. Copper was wanted to make temple bells and images, and those who have seen the great bronze bells and idols in Japan will quickly realize how the demands of the Buddhist priests must have cleared all available stocks off the copper market. And not only so, but hundreds of thousands of "cash" were thrown by the pious into the melting-pots from which the bells and idols were made, so that the decision to suspend minting operations was due as much to religious fervor as to undeveloped mineral resources.

That considerable progress was made in developing the mineral resources of Japan during the long years that minting was suspended is proved by the fact that early in the 15th century large quantities of copper were exported to China. An interesting relic in the shape of a shipping invoice (1458) shows that among the ship's cargo were 410,000-lb. of sulphur and 206,000-lb. of copper. Gold, too, was much more valuable in China than Japan, and since the metal fetched from four to six times its home market price when sold in Ningpo, it is fair to suppose that a large proportion of the gold mined in Japan found its way across the sea to Chinese buyers. Hence, perhaps, the fanciful stories about Japan being wondrously rich in precious metals. It is known that there was a marked



development of mining in Japan about this time, and when the great Hideyoshi began to resume the minting of gold and silver coins, the gold mines at Sado and the silver mines at Ikuno had increased their output enormously as the result of adopting improved (though still very crude) methods of working.

This was in 1587, and during the century following Dutch traders carried away 50 "tons" of silver every year, and later on concentrated their energies upon the copper market, of which



Sumitomo Company. Aerial Tramway at the Besshi Copper Mine

metal they are said to have carried away 1,000 "tons" a year. Mention has been made above of the adoption of "improved" methods of working mineral deposits; reference must be now made to an interesting incident which occurred somewhere about 1609, which shows that even in those days the Japanese were eager to learn from foreigners how their own methods could be improved upon. The Shogun Ieyasu engaged some shipwrecked Dutch sailors to give what instruction they could in casting cannon and in artillery practice. Next he seized the opportunity of another shipwreck to suggest to the governor-general of the Philippines (an involuntary visitor to Japan) that 50 Spanish mining experts should be sent to Japan to introduce new methods of working.

### Ieyasu's Policy

The Japanese in those days had no great liking for the Spanish or the Portuguese since all visitors from Manila and Macao were suspected to be bent upon religious propaganda, but so anxious was Ieyasu to get expert advice and assistance that he was prepared to take the risk of politico-religious complications following the introduction of Spanish subjects to the country. The governor-general of the Philippines agreed to the suggestion, but on hard terms. First, in regard to the output of the mines, one-half

was to be given to the Spanish experts, and the balance equally divided between the King of Spain and Ieyasu. More than this, he stipulated that the King of Spain should send officials to protect his majesty's interests in the mines, and, more presumptuous still, in the circumstances then existing in Japan, Spanish priests were to accompany these officials and erect churches wherein their compatriots could receive spiritual consolation. Yet so anxious was Ieyasu to get expert assistance from foreigners whereby to develop the country's mineral resources, that he agreed to the amazing terms submitted; but the plan never materialized, owing to the death of the Shogun.

What changes might have been brought about had this enterprising project been brought into operation it is difficult to say. The Dutch at Deshima for two centuries exerted an enormous influence for good in a quiet way, for, unlike the visitors from Manila and Macao, the Hollanders meddled not at all in politico-religious affairs. With 50 (and eventually, perhaps, many more) Spaniards introducing foreign methods, words and ideas to Japanese who knew nothing of the outside world, and had not even been impressed by a sight of the great ships from overseas which periodically visited their shores, it is not impossible that Ieyasu's experiment would have had far-reaching results. With improved methods of mining might have come improved methods in many other directions, possibly leading to quite a different course of events in the Far East from those now recorded in history.

In spite of the fact that the outfit of a miner consisted of nothing more than a wedge and a hammer, quantities of gold, silver and copper were exported from Japan through the Dutch traders. Finally, only the baser metal left the country, to the extent of a thousand "tons" a year—but not tons of 20cwt. The so-called tons of gold and silver were merely units representing value in gulden, and a "ton" of gold represented a quantity valued in those days at 100,000 gulden. But the export was substantial, all the same, and early in the 18th century bitter complaint was made that Japan was being drained of all the gold, silver and copper mined during Ieyasu's time and since, and bartered for foreign fripperies of sundry descriptions that could be done without.

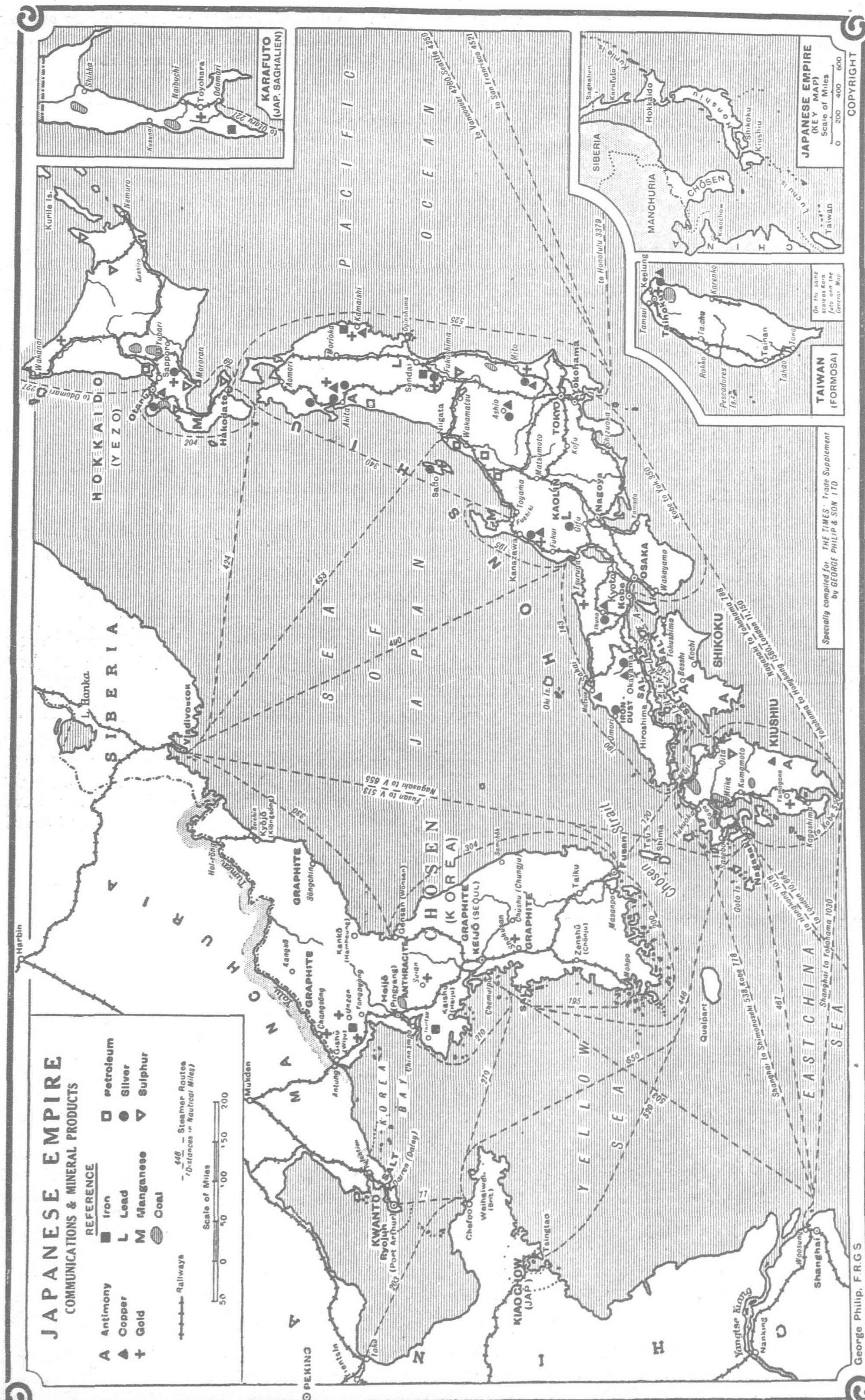
### A Drastic Reply

That this protest had some effect appears evident from the fact that towards the end of the 18th century the Dutch were complaining bitterly about the difficulty of getting sufficient supplies of copper for export. The answer they got was exceedingly brusque; they were told that if they again pressed for larger supplies not only would they be refused, but the goods the Dutch had imported to exchange for copper would be burned, and all further trade forbidden. As the Hollanders continued to trade at Deshima until 1858 it may be assumed that they were content with such share of the "precious marrow of the Japanese mountains" as was permitted to come their way.

Yet, while the scheme for introducing foreign mining experts fell through, the Japanese were already employing Portuguese and Dutchmen to instruct them in the arts of metal-working. There was a foundry in Yedo (Tokyo) under Dutch management in the middle of the 17th century, in addition to that at Hirado, and as far back as the middle of the 15th century there is record of a Portuguese being engaged for three years in the capacity of cannon-founder. Some fine specimens of bronze ordinance, relics of a battle in 1580, are still in existence. At Hirado (where the Dutch first carried on trade, before being transferred to Nagasaki, or Deshima) cannon were made with material and labor at less than half the cost "in Christendom," and the output totaled some 40 pieces a year, both of brass and of iron.

Much could be written concerning the wonderful work done in Japan between the 10th and 14th centuries by the makers of swords and armour, in further proof of the skill and ingenuity of the Japanese in metal-working. With the crudest of tools and methods, there was nothing—from casting huge bronze bells and Buddhas to the tempering of a tiny dagger or a great two-handed, double-





JAPANESE EMPIRE—COMMUNICATIONS AND MINERAL PRODUCTS

edged sword—that the Japanese workers in metal could not accomplish, and their achievements in those far-off times are objects of astonishment and admiration even to-day.

Such in outline is the history of mining and metal-working in Japan during the long period when the country was neither commercially nor industrially of any importance—though not lacking in interest.

### Fifty Years of Enterprise

The last 50 years were a half-century of intense effort in energy and enterprise which has brought Japan to a position of no small importance as an industrial and commercial power. In 1868 an Englishman named Glover was engaged by one of the feudal lords to sink a shaft in Kiushiu at a place called Saga, about half-way between Nagasaki and Moji, and not far from the now well-known coaling-port of Karatsu. In 1870 the Japanese government decided to engage foreign expert assistance in developing the gold mines on the island of Sado, off the west coast of Japan—whither persons guilty of criminal and political offences of a certain degree had been exiled. For more than 200 years gold had been obtained on the island by the most primitive methods. The quartz was crushed with iron mallets, and although there were some 4,000 miners, crushers and laborers employed they could not handle more than about seven tons of ore a day.

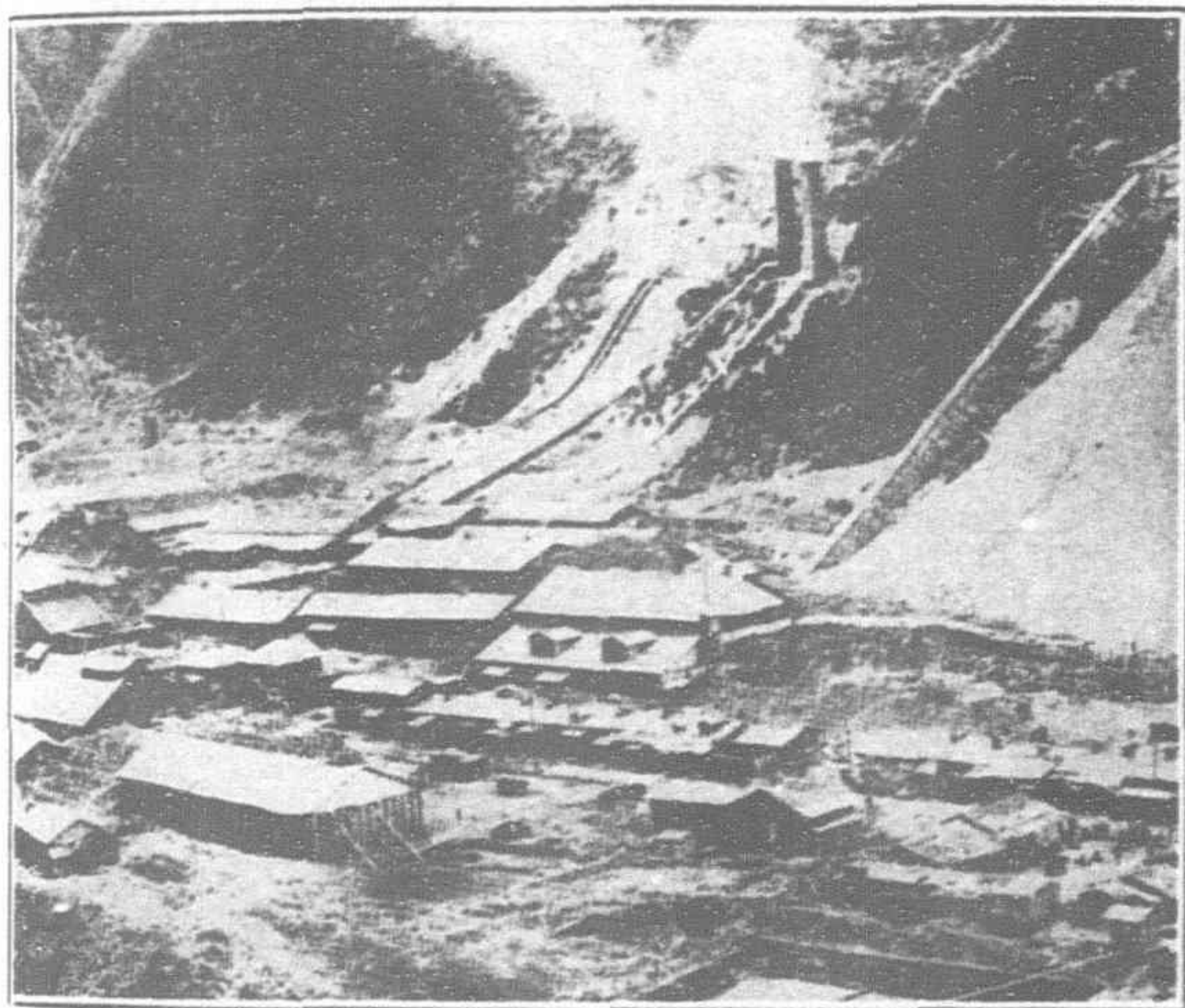


The government was led to believe that the introduction of modern machinery would increase the output considerably, and that the amount of gold thus recoverable would be very substantial. Accordingly a foreign engineer was engaged, and the necessary plant was obtained from Europe, but it was found that the field was not so rich as it was expected to be, and for many years working was continued at considerable loss. In 1872 the Japanese government established a school for instruction in mining and metallurgy, and in the same year explosives were used for the first time, under the guidance of one of the foreign experts engaged by the government. From these small beginnings came the great mining industry of modern Japan, the importance of which can be gaged from the following figures of a year's output:—

Copper	...	...	...	96,000 metric tons
Silver	...	...	...	6,500,000 oz. fine
Lead	...	...	...	11,000 tons
Antimony	...	...	...	400 tons*
Gold	...	...	...	245,000 oz.
Zinc	...	...	...	39,000 tons
Manganese ore	...	...	...	55,000 tons
Phosphorous ore	...	...	...	192,000 metric tons
Coal	...	...	...	28,000,000 metric tons
Sulphur	...	...	...	64,000 metric tons
Sulphur ore	...	...	...	21,000 metric tons

figures need not be considered at the moment. Of the proved coalfields the estimated deposits amount to 3,760,000,000 tons, of which 1,738,000,000 tons are regarded as being practically available. Of this coal "in sight," 1,000,000,000 tons are in Kiushiu, 568,000,000 in Hokkaido, and 170,000,000 in the various other small fields scattered through the main island. In 1919 the output of coal was the largest on record. During the war the industry was most active, owing to the enormously increased home consumption, consequent upon the great boom in manufacturing industries and to demands from various points overseas.

It is obvious that there is no cause for anxiety in Japan about coal resources, but it is otherwise as regards the cost of coal. Wages and all other charges have increased enormously, and mine-owners are much worried about the restriction of female labor which was agreed upon at the international labor conference held at Washington. In Kiushiu alone there are 50 000 women working in and about the coal mines (of whom probably 30 000 go down the pits), and it is declared that night-work will be impossible if the law prohibits the employment of women. The introduction of an eight-hour day all round could be managed without difficulty, but the abolition of female labor between 10 p.m. and 5 a.m. would be disastrous—so the mine-owners say. On the other hand, there is little doubt that the conditions under which most of these women work are prejudicial to the ultimate prosperity of the nation, and



Arakawa Mine

## TWO MITSU BISHI COMPANY MINES



Osaruzawa Mine

The total annual value of Japan's mineral products stands at about 45,000,000 sterling, of which coal and copper represent the most valuable individual items. Both are subject to violent fluctuations in price, due both to domestic and outside conditions, but between them coal and copper may be taken as representing about one-half of the country's mineral wealth.

Most of the coal raised in Japan is mined in Kiushiu, the southern island; the principal ports—Nagasaki and Moji—are known the world over as coaling stations for ships of war and of commerce. About 75 per cent. of Japan's coal output comes from Kiushiu, and 10 per cent. from Hokkaido, at the other extreme of the island empire. The balance is supplied by scattered mines on the main island, from Shimonoseki to the north of Tokyo. In Karafuto (the Japanese half of Saghalien) there are some very rich seams of similar quality to those worked in Hokkaido and running in places to a thickness of 50-ft. An official estimate places the amount of coal available in workable seams not more than 2,000-ft. below drainage level at 820,000,000 tons, with workable seams at a lower depth which will give another 2,940,000,000 tons. Possible, but unproved, deposits are set down at over 5,000,000,000 tons, according to the same official estimates, but these

the industry will adjust itself to the new conditions (when imposed) without any such catastrophe as is apprehended by those now employing women in the mines.

### Copper Resources

Japan stands second on the list of the world's copper-producing countries, though she comes a very long way behind the United States. More than half the world's output is American copper, but of the other half-dozen leading producers Japan stands first. The Ashio and the Besshi mines are among the most important sources of supply, the former being regarded as the largest copper mine in the Far East. A remarkable hydro-electric plant at Ashio, generating over 10,000 horse-power, is an interesting feature of a gigantic undertaking, while no less interesting is the "one big family" system of working the Besshi mine. This property has been in the possession of the Sumitomo family since 1691, and the men and women employed there are the descendants of generations who have worked there before them. It may be added that the eight-hour day was introduced in this mine many years ago by the proprietor, and no women are employed underground. In a country—and an industry—where consideration by employers for the welfare of their workers is not yet universal, the "happy family" of some 10,000 men, women and children at Besshi is at least worthy of passing mention. Other important copper mines are those at Kosaka (in one of the northern-most provinces), at Hitachi (north of Tokyo), and Sagonoseki (in Kiushiu).

\*Enormous quantities of antimony were shipped to the United States during the war, and the 1915-17 output amounted to some 24,000 tons. Trade has now dropped back to pre-war conditions. In 1917 the production of copper totaled 111,000 tons, but owing to the violent fluctuations of the metal market the output from all Japanese mines varies considerably according to circumstances.



These five mines contribute considerably more than half the total output of the country, the score or more of other mines being quite small concerns.

### American Competition Keen

For about 12 months prior to the outbreak of the war, the export of copper from Japan was at a very low ebb, owing to heavy slumps in prices. As about two-thirds of the output was ordinarily exported, the industry generally was in a most depressed condition, but prices went up with a rush on the outbreak of hostilities in Europe. Large orders were received from Europe and America, and production was rapidly speeded up to meet the urgent requirements of the times. In 1917 the copper exports of Japan amounted in value to nearly nine millions sterling; the following year they dropped to four millions, and in 1919 to less than two millions. Last year there was a further decrease, the total export amounting only to 12½ million yen (say £1,250,000). In 1919 large quantities of copper were imported into Japan, owing to the high prices then prevailing in the country, but this business was purely speculative, and must not be regarded as indicating that domestic production has fallen below the demand. Producers have great hopes of increasing their business with China, but American competition in that market is very keen, in spite of the long haulage.

Most of the silver produced in Japan comes from the great copper mines. The gold and silver mines on Sado Island (mentioned above) are the most important of their kind, but the output of silver from this source is only about one-sixth of the quantity recovered by electrolytic treatment of the copper ore mined at Ashio. It is probably correct to say there is no silver mine in Japan of any size which is a paying proposition; on the other hand, the amount of gold and silver found with copper is very considerable, and so an increased output of copper invariably means an increased production of gold and silver in the country. In 1917 the output of silver in Japan was over seven million ounces, but this figure does not bulk very large against the 75 millions from Mexico and the 55 millions from the United States. The mines from which silver is obtained are widely scattered, and are distributed throughout the country from the extreme north to the extreme south. Of the former those at Innai (opened in 1599) are worth mention, and were once the most productive in the country; of those further south the mines at Ikuno, near Kobe, are of importance. Two mines are worked for gold and silver, and a third for silver and copper. Ikuno has the reputation of being one of the best-managed mining concerns in Japan.

### Lead and Zinc

The domestic output of lead is insufficient to meet requirements, amounting to less than 10,000 tons. Imports of ore and metal are necessary, and during the war some very large orders were placed in Australia, China and elsewhere in order to meet the demands for munition-making and other purposes. New smelting works were erected, and in 1919 lead ingots and slabs to the value of over a million sterling were imported in addition to large quantities of ore. Last year, however, there was a substantial decrease in both lines, and import figures are gradually resuming more normal proportions. The extension of lead works and refineries suggests that more ore and fewer slabs will be imported in order to meet the domestic requirements of industry.

Prior to the war some 30,000 tons of zinc ore were exported annually from Japan to Europe, and about one-third of that quantity was imported from Britain, Belgium and Germany in the shape of slabs, sheet and dust. There were some refineries in Japan, but very small and insignificant concerns; when the demand for the metal increased, and over-seas supplies were cut off, the existing plants were rapidly extended, and many new refineries established. Instead of exporting ore for treatment, Japan began to import the raw material and export the finished article; in 1917 zinc

ingots and slabs were exported to the value of considerably over two millions sterling. Since then there has been a considerable slump in the industry, as most of this business was in connection with munition-making in Europe. In 1919 the export of zinc dropped down to about £300,000, and last year there was a further slump to the microscopic figure of £12,000. With an annual demand for 20,000 tons, and a domestic supply of only 6,000 tons, there has been a big market in Japan for foreign zinc, most of which has been imported from the United States.

### Sulphur and Petroleum

An item which must not be overlooked, however, is sulphur, which is very plentiful in the country and was very largely exported during the war. Production more than doubled between 1913 and 1918, and exports more than trebled, owing to the great over-seas demand in connection with the war. In 1919 there was a very heavy slump in the export trade, and the figure indicates a rapid return to pre-war level. The domestic demand is large, and the mines contain ample supplies. Generally speaking, only the high-grade deposits are worked—those containing 40 per cent. of sulphur—and over 50,000 metric tons per annum of sulphur comes from Hokkaido alone. Another important centre is Fukushima, with an output of 15,000 tons, and there are numerous smaller mines in operation.

About half the domestic demand for illuminating oil is met by local production; the balance is imported from the United States and Java. Oil was located in Echigo province a couple of centuries ago, but not until 1818 was any attempt made to sink a well. About 50 years ago the Japanese government sent one of its foreign mining experts to survey the field and report upon its prospects, but although there were ample proofs of large oil deposits nothing was done to develop the industry on modern lines before 1889. Until that time wells were dug by hand labor, and the crude oil was hauled to the surface by primitive hand pulleys. From 1890, however, the old order of things began to give place to new; foreign machinery of the latest pattern was imported and put into operation and a considerable amount of foreign capital (American) was sunk simultaneously with the new wells. Pipe lines were built to convey the oil from the fields to the refineries; new deposits of oil were found; in short, the oil boom had arrived. The wells vary from 300 to 2,000-ft. in depth, and frequently the oil—being held under pressure between impervious strata of rock—escapes with considerable force. The oil from some fields contains 50 per cent. of lamp oil, but other samples are of much lower quality.

The introduction of the rotary system of sinking wells has opened quite a new chapter in the history of the Japan oil industry, and, although the foreign interests have been long since bought out, the progressive methods which were introduced with the investment of foreign capital have been retained and extended.

### Successful Lines

Copper wire, electric cables, and a very wide range of electrical goods are lines in which very rapid progress has been made. Antimony, aluminium, and enamel ware are other lines which have been well developed during the last few years. It is true that a quantity of very inferior goods has been put out on the export market during the last six years, which has made many suspicious of all goods made in Japan. Yet it is also true that many importers of Japanese goods—by taking precautions to see that their orders have been placed with reliable manufacturers—have handled very large consignments and disposed of them without the slightest complaint. That considerable damage to the reputation of Japanese goods has been done by careless—if not criminal—disregard of buyers' instructions admits of no doubt, but there are numbers of firms who have established a name for themselves as reliable manufacturers of all lines of metal goods, and business engagements entered into with such firms will be honorably carried out.



# The Natural Resources of Zamboanga

## Opportunities for Development

By P. J. WESTER, *Agricultural Advisor*

**Z**AMBOANGA province includes most of the peninsula projecting east of Pangil Bay in the north and Illana Bay to the south, on the Island of Mindanao, and Basilan, Olutanga and some 146 smaller islands, and has an area of 6,383 square miles and a population of 146,846 inhabitants. Zamboanga is, therefore, larger than the states of Connecticut and Rhode Island.

Located between 121° and 123° east longitude, and between 6° and 9° north latitude, Zamboanga is bounded on the east by Misamis province, Pangil Bay and Lanao; on the south by the Celebes Sea; and on the north and west by the Sulu Sea. The coast line, approximately 700 miles long, is indented by several bays of which Sibugay, Dumankilas and Sindangan are the largest. Caldera Bay, Masinlok, Port Santa Maria, Panabutan, Talagilung, Sambolauan, Margosatubig and Port Banga are smaller but well protected bays with excellent anchorage.

Zamboanga peninsula is largely a mountain range, with several peaks rising to now and then 600 or more metres in height. Numerous short streams and rivers wind their way between the mountains to the sea, of which the Dipolog, Dapitan, Lubungon, Piau, Siokon, Sibuku, Vitali, Kumalarang, Kabasalan, Kulasian, Tukuran, Bakalan and Labangan are the largest and the most important. Many of these rivers could be utilized as a source of power for industrial purposes but all are too small and too shallow to be navigable for any but small river craft, and then only for a few kilometres inland, owing to the rapidly rising formation of the land.

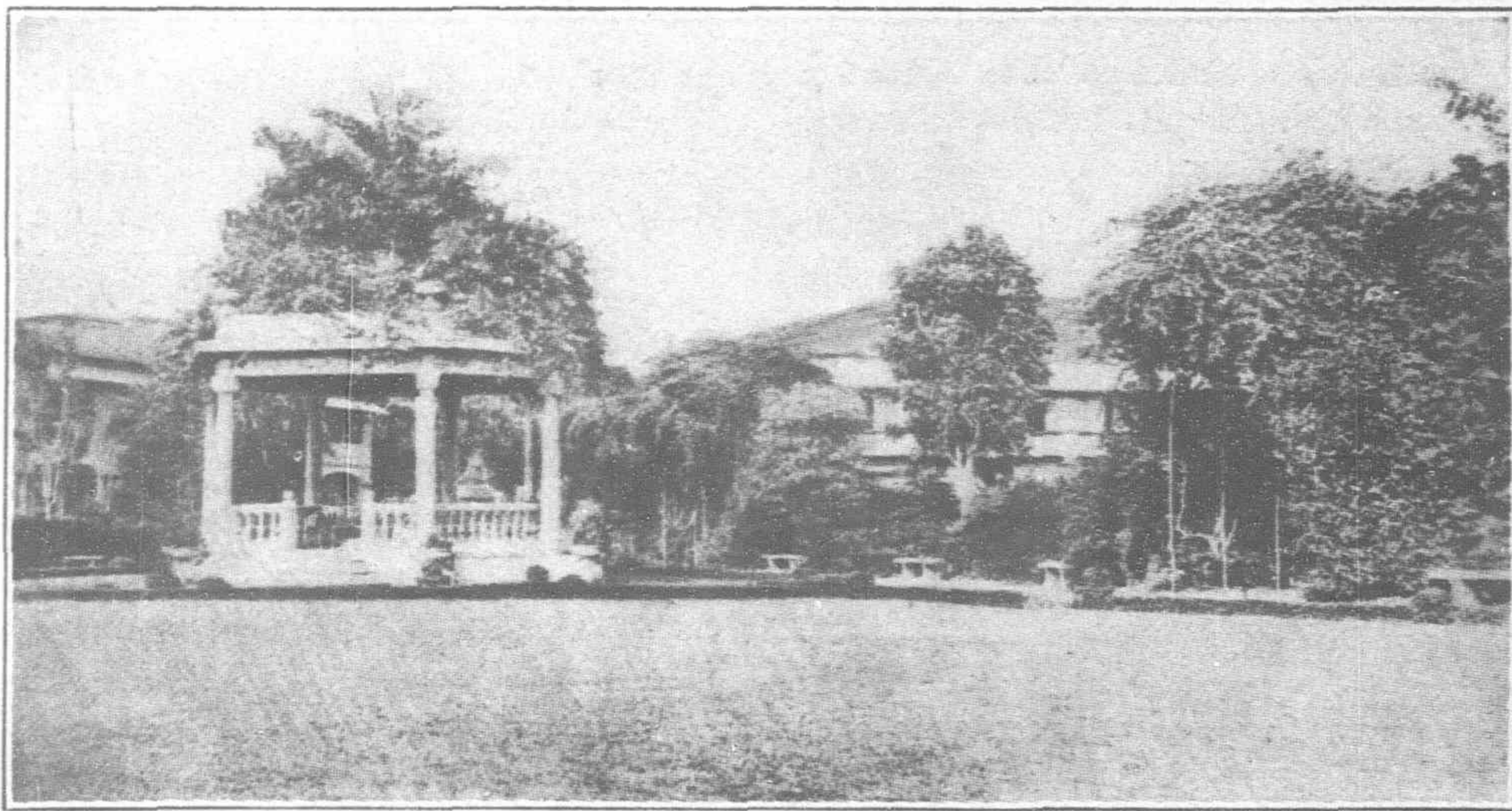
Because of the mountainous character of the mainland, this part of Zamboanga is not well adapted to agricultural pursuits except in small, isolated valleys and pockets here and there along the coast, usually at the mouth of a river. The largest of these valleys are located at Dipolog, Dapitan, Lubungon and Sindangan. Then, the following rivers flow through smaller but also very fertile valleys:

The Tukuran River, which empties near the Lanao boundary into Illana Bay and is navigable for six miles from the coast by small boats; the Labangan River, which empties a few miles east of the Tukuran River, which it exceeds in length and volume of water; the Kumalarang River draining Lake Danao and emptying into Dumankilas Bay; the Kabasalan River, which forms a small delta emptying at the head of Sibugay Bay, navigable for motor boats for about ten miles; the Bakalan River, navigable for a small launch for five miles from the coast; the Dinas River, that forms a marshy delta emptying into the sea in three arms off Pisan Island; the Sibuku River entering the bay of the same name on the west coast of the peninsula; the Siokon River flowing into Siokon Bay; and the Piau or Sindangan River, which empties into Sindangan Bay and is said to be navigable for small motor boats for ten miles from the mouth of the river. The basin draining into Sindangan

Bay includes the largest single grazing area in Zamboanga province adapted to cattle raising. In the large, fertile Dipolog valley, the river is navigable by motor craft to Polanko and by smaller boats still further inland. The Dapitan river is navigable by launch to Ilaya.

The land formation of the Island of Basilan, the largest and the most important in the province, some 430 square miles in extent, located about 20 kilometres to the south of Zamboanga, the provincial capital, differs radically from that on the "mainland." The rise of the mountains is here so gradual that though several attain an elevation ranging from 300 to 1,020 metres, the greater part of the now heavily timbered slopes ultimately will be available for agricultural purposes when the lumber cutting now in progress is finished. Between the mountains lie several plains of unrivaled fertility of which the Lamitan plain, extending on both sides of Gubauan River and emptying into a shallow bay to the northeast; the Balaktasan plain, extending from Latuan to Isabela, centred around Balaktasan River, which really is only an extension of the Lamitan valley; and the Malusu valley, on the southwest of the river of the same name, are the most extensive. While the mountains are forested, the vegetation on

the plains and on the lower slopes consists of secondary jungle growth and cogon, *Imperata cylindrica*. The soil varies from rich, alluvial deposits devoid of, or containing more or less laterite to volcanic ash; as a rule it is friable. Generally free of stones and boulders, again, in other localities these are present in such numbers as to seriously impede ordinary cultivation and render the employment of motor-drawn implements impracticable. Accord-



View in Municipal Plaza, Zamboanga

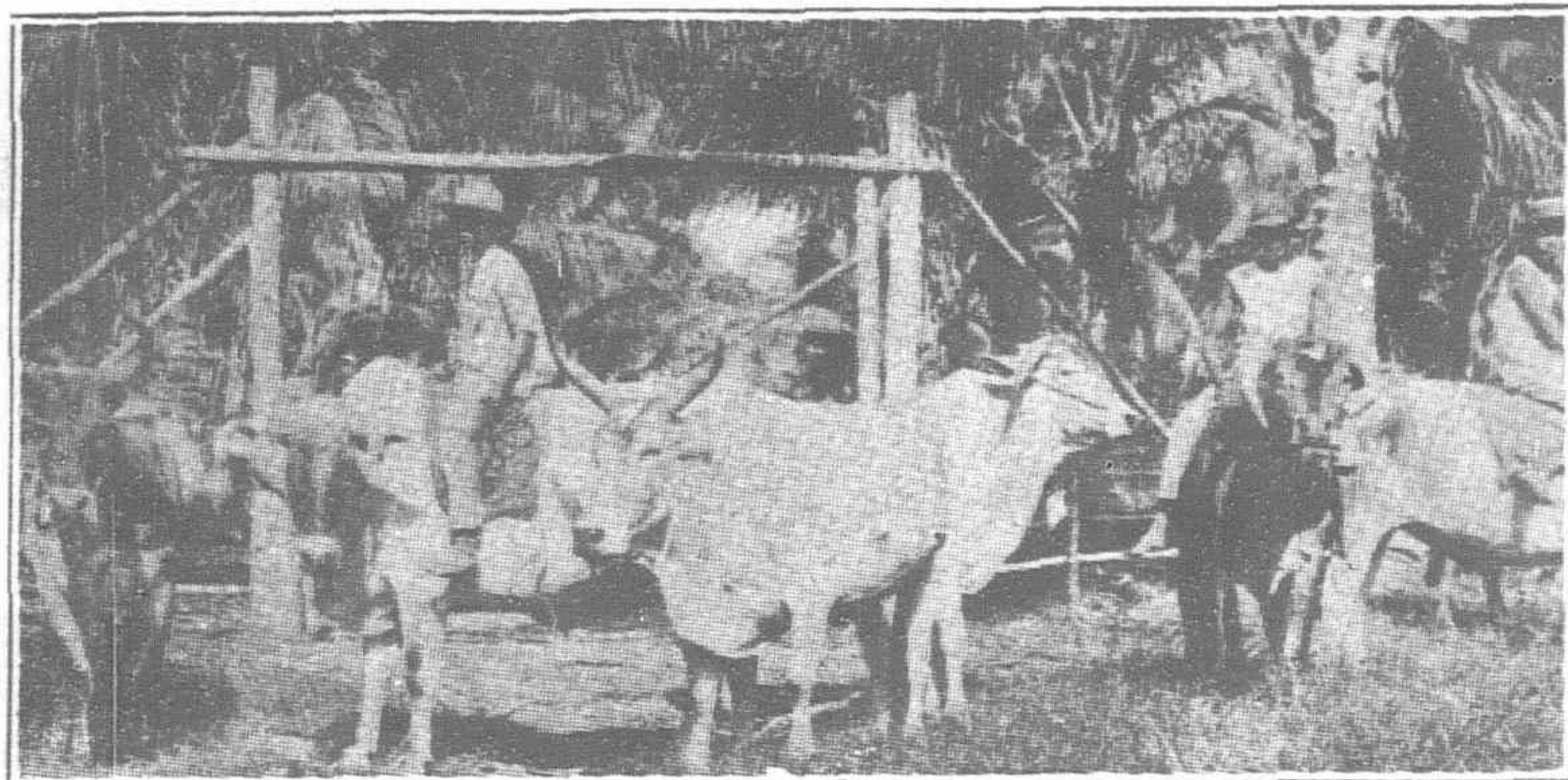
ing to the surveys of the bureau of forestry, Zamboanga has 1,320,233 hectares commercial forest, 78,924 hectares cogonales. Mangrove swamps and non-commercial forest cover 102,726 hectares, 31,906 hectares or 1.9 per cent. of the land is under cultivation, 119,408 hectares are still unexplored.

### Climate

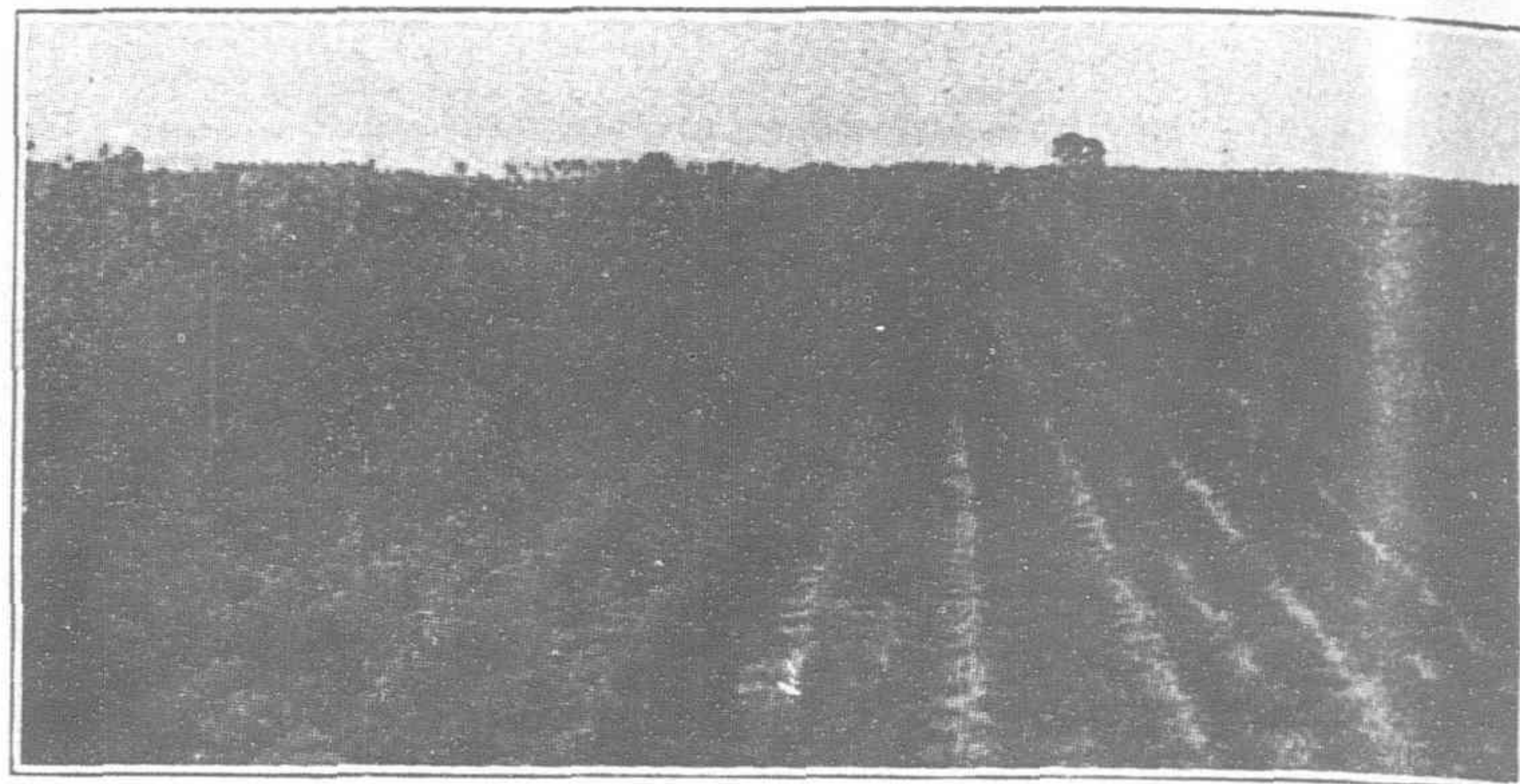
The rainfall of Zamboanga is quite varied, which in part may be seen from the following table adapted from the records published by the Philippine weather bureau.

Zamboanga has the lowest mean annual precipitation recorded in the Philippines. This condition applies, however, to a very circumscribed area adjacent to the city itself, and the rainfall is very much greater within a few miles of Zamboanga proper. In Dapitan the rainfall is more than double that of Zamboanga, in Isabela nearly so. Again, the rainfall table of the latter place, while probably representative of the coast line and valleys in Basilan, does not indicate the true figures of the precipitation in the interior, where the rainfall on at least some mountain slopes





Cattle and Coconuts make a Good Combination, Patalon, Zamboanga



Coffee and Coconut Plantation, Patalon, Zamboanga

at even less than 150 metres' altitude is twice that in Isabela, with still greater precipitation at the higher elevations. In the Margosatubig district the rainfall, which is very equally distributed throughout the year, is estimated at not less than 3,000 millimetres annually and it is probably considerably greater.

### Population

As stated already on a previous page, the population is over 146,000 souls. A few of these are Americans and Europeans, mostly living in Zamboanga and representing commercial houses, or in charge of plantations. The Filipinos live principally in the Dipolog and Dapitan district and in and around Zamboanga, and are occupied by agricultural pursuits. The Moros inhabit the coast and the adjacent islands from Lanao on the south coast to Sindangan in the north, and gain their livelihood by fishing and farming, chiefly the former occupation. The Subanos inhabit the interior of the Zamboanga peninsula, and the Yakans inhabit Basilan. These two tribes are both very primitive and they support themselves by hunting and farming.

For plantation labor the Subanos are considered the best workers. Yakans are less efficient. The Filipinos and the Moros are engaged in their own pursuits and with few exceptions are not available for hire. Here as in all other provinces of the archipelago, the local trade is largely in the hands of Chinese. The Japanese settlers are few.

### Historical Review

To the American having in mind the rapid development of his own country, the old history of present-day Zamboanga seems almost inconceivable.

Dapitan passed under the yoke of Spain in 1565. Cinnamon, probably the *kami*, *cinnamomum mindanaense*, is recorded to have been exported in large

quantities as early as 1598 from Caldera, which for some time previous had been a trading post. The first Jesuit mission was established in Dapitan in 1631. The earliest Spanish settlement in Zamboanga was made in 1635. Basilan was ceded to the Spanish crown in 1726, and the fort at Isabela was constructed in 1842. In 1831 the first custom house was established in Zamboanga. The city was occupied by the Americans in 1899 and Zamboanga was made a province and civil government established in 1914.

### Agricultural Industries

Coconuts, rice, abacá, corn, rubber and coffee are the principal crops of the province, in the order named, and were, in 1918, planted in the following areas according to statistics compiled by this bureau:

Crop	Area, hectares	Quantity	Value Pesos
Coconuts	... .. <sup>a</sup> 20,560	<sup>a</sup> 61,299	<sup>c</sup> 9,183,638
Rice	... ..4,020	<sup>d</sup> 70,448	291,953
Abacá	... ..4,799	<sup>e</sup> 2,439	826,620
Corn	... ..3,642	<sup>d</sup> 37,243	201,935
Sugar cane	... ..729	<sup>e</sup> 537	76,065

<sup>a</sup> Calculated at the rate of 204 trees to the hectare.

<sup>b</sup> Copra, metric tons.

<sup>c</sup> Value of all coconut products.

<sup>d</sup> Hectoliters.

<sup>e</sup> Metric tons.

By far the most coconuts are produced in the settled country adjacent to Zamboanga, from Patalon in the north to Manikahan on the east

coast. Smaller areas are planted in Isabela, Basilan, and in the Dipolog and Dapitan valleys, with scattered, small plantations here and there along the coast. In rice production Dipolog leads, which also is the principal abacá district. Zamboanga leads all provinces in the Philippines in rubber production. Considerable



Arabian Coffee, 2 years old from planting in the field, Patalon, Zamboanga



Robusta Coffee in the Fourth Year after Field Planting, Patalon, Zamboanga



quantities of coffee is also being grown. The production of sugar, cacao, maguey and tobacco is insignificant.

The principal vegetables and miscellaneous food crops grown in Zamboanga do not differ very greatly from those in other provinces in the Philippines except that cassava is very extensively grown by the Moros. The other more important vegetables include: camotes, squash, pumpkins, upo, tomatoes, egg-plants, sitao, peanuts, gabi, ubi and cucumbers.

At San Ramon Farm a very great variety of temperate zone vegetables are grown very successfully. The production of Bermuda onions of excellent quality is especially worthy of note, considering that this item forms such an exceptionally high figure in the vegetable imports of the archipelago, in 1918 amounting to 4,702,912 kilos valued at P.331,883.

### Plantations

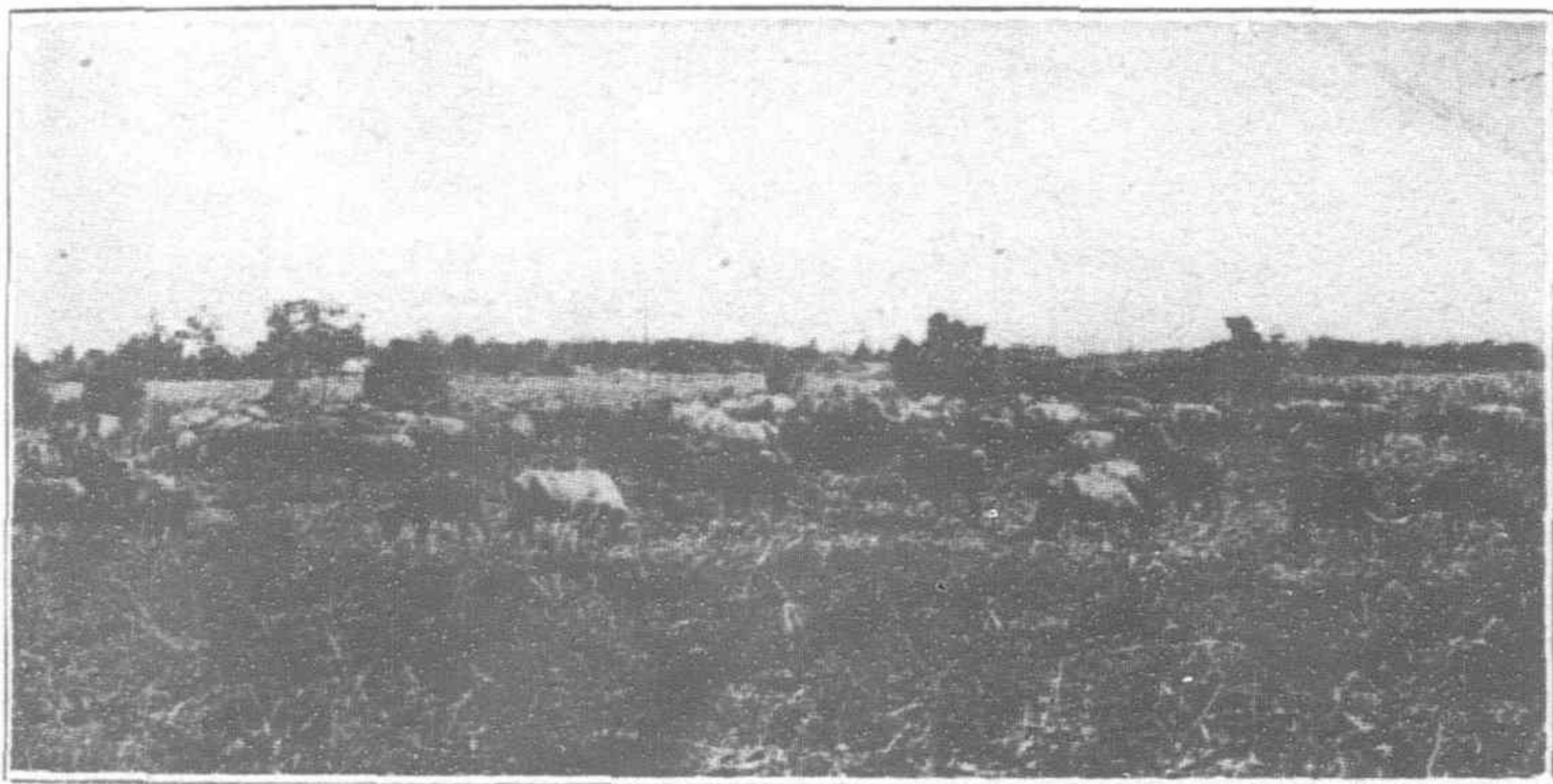
Aside from several more modest ventures, nine corporations capitalized at from P.50,000 to P.500,000, are engaged in developing plantations of coconuts, abacá, coffee and rubber from 230 to 1,024 hectares in extent. The most notable of these is the Basilan Plantation Co. with an area of 1,024 hectares, which is the pioneer rubber plantation in the Philippines and now has about 81,000 para rubber trees growing, and a large area planted to coconuts. Some 600 hectares are under cultivation on this plantation and the clearing of the remaining jungle has been delayed only because of insufficient labor. It is the success attained by this plantation that has induced other capitalists to later rubber

the past year. The concession of this company includes some 1,000 hectares of excellent land located on the Balaktasan river, a short distance from Isabela, Basilan. More than 500 hectares have already been cleared, of which a large area is planted to para rubber, and at the present rate of progress the entire tract will probably be occupied by rubber at the end of 1921. The American Plantation Company is the first concern to employ tractors in developing a plantation in this part of the Philippines.

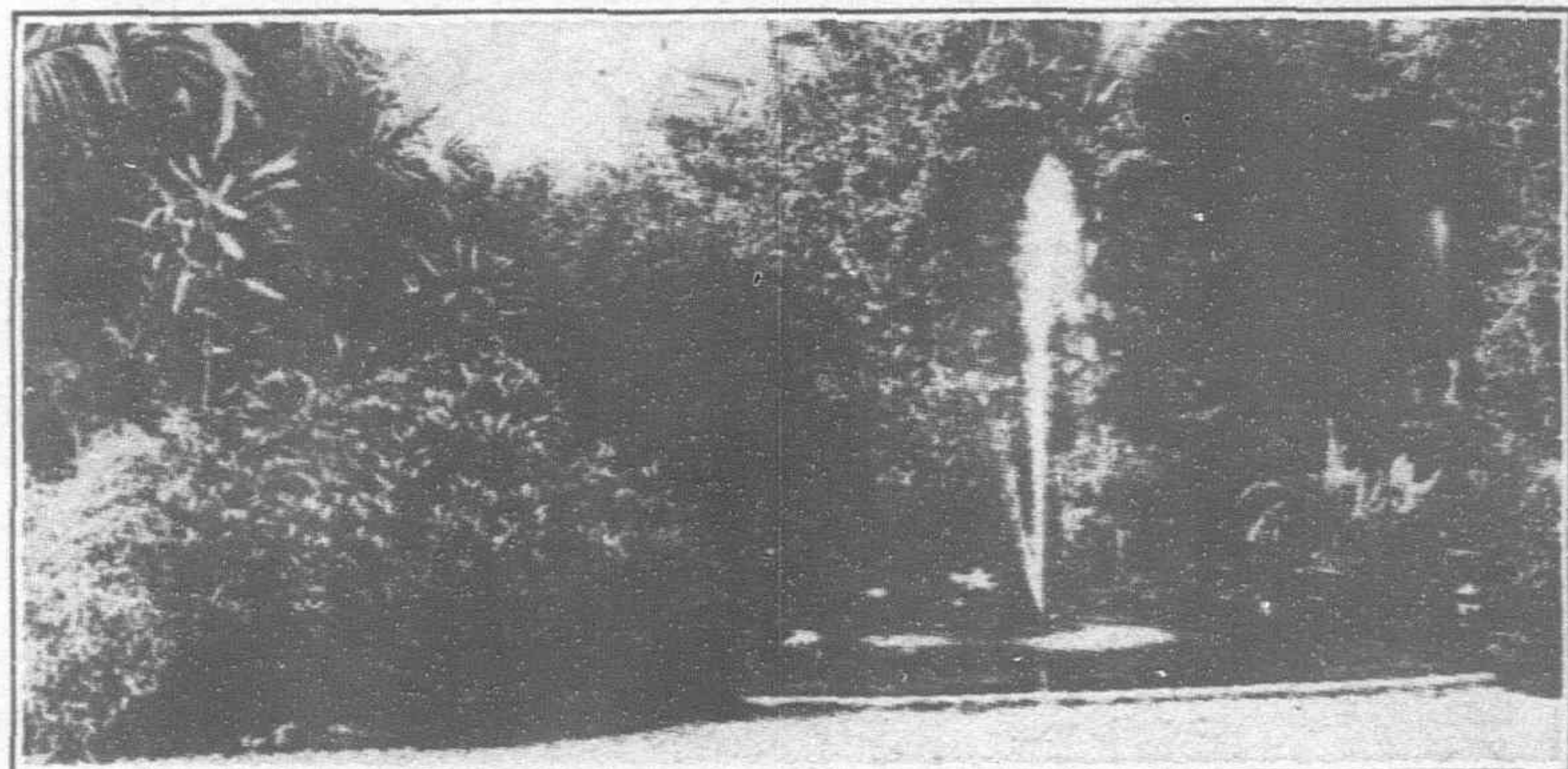
### Natural Resources and Products other than Agricultural

The island of Basilan presents very great potential opportunities for agricultural development but the immediately available resources of the province are the large forests, which are exceeded in area and value only by those of Davao and Cotabato. The timber trees range from the soft lightwoods, such as lauan, *shorea* spp., *pentacme contorta*, *parashorea plicata* and *anisoptera thurifera*; lumbayao, *tarrietia javancia* and calantas, *toona calantas*; to heavy hardwoods, such as yakal, *hopea* spp. mancono, *xanthostemon verdugonianus*; ipil, *intsia bijuga*; molave, *vitex* spp.; pagatpat, *sonneratia scaseolaris*; camagon, *diospyros discolor*; d'nglas, *eucalyptus naudiniana*, narra, *pterocarpus indicus*; and tindalo, *cassia javancia* and *pahudia rhomboida*, of which the hardwoods are used for posts, piles, ties and cabinet woods, while the lightwoods are employed for light construction and interior finish.

Lumber mills are operated by the following corporations: The Basilan Lumber Co., with mills at Isabela and Malusu; the



A Herd of Carabaos, Philippine Islands



Corner in Municipal Plaza, Zamboanga

ventures in Basilan and Mindanao. A modern rubber drying house 12 by 36 metres two stories high has been erected by this company within the last year.

The 17,000 para rubber trees on the Balaktasan estate, Basilan, acquired by Japanese in 1918, continue to make satisfactory progress.

The Patalon plantation, a few kilometres to the north of San Ramon, devoted to coconuts and coffee, is signally successful and is an eminent example of what can be accomplished in Philippine plantation ventures under good management. As coffee plantations go in other countries, the one at Patalon is, of course, a very modest affair, including only some 36,000 trees. Nevertheless, it enjoys the distinction of being at present the largest rationally cared for coffee plantation in the Philippines, and the first to definitely demonstrate that robusta coffee can successfully be grown in these islands. The soil being of a very patchy character, it has shown how wonderfully productive robusta coffee is when the soil conditions are what they should be for this coffee, but failure in other fields have strikingly demonstrated how unprofitable robusta is when planted under uncongenial conditions. Robusta and liberian are the two varieties principally planted, while several of the new, rust-resistant kinds are also being tried; the excelsa and quillon being especially promising. The liberian coffee produced is disposed of at P.94 and robusta at P.74 per 100 kilos in Zamboanga.

The American Plantation Company has made more rapid progress in development work than any other corporation during

Olutanga Sawmill Co. with mill at Olutanga; the Mindanao Sawmill Co., with mills at Naga-naga and Margosatubig; and the Port Banga Sawmill Co., with mill at Bangaan.

Other forest products which are collected in greater or less quantities for export are almaciga, gutta-percha, cascalote (tan bark), rattans and beeswax, but the production of all could be greatly increased.

Coal of good quality has been known for a number of years to exist on the peninsula between Payao and Malangas, and the National Development Company, with headquarters at Malangas, has been occupied for nearly two years with surveys and other preliminary work incident to mining the coal deposits which are believed to be very extensive.

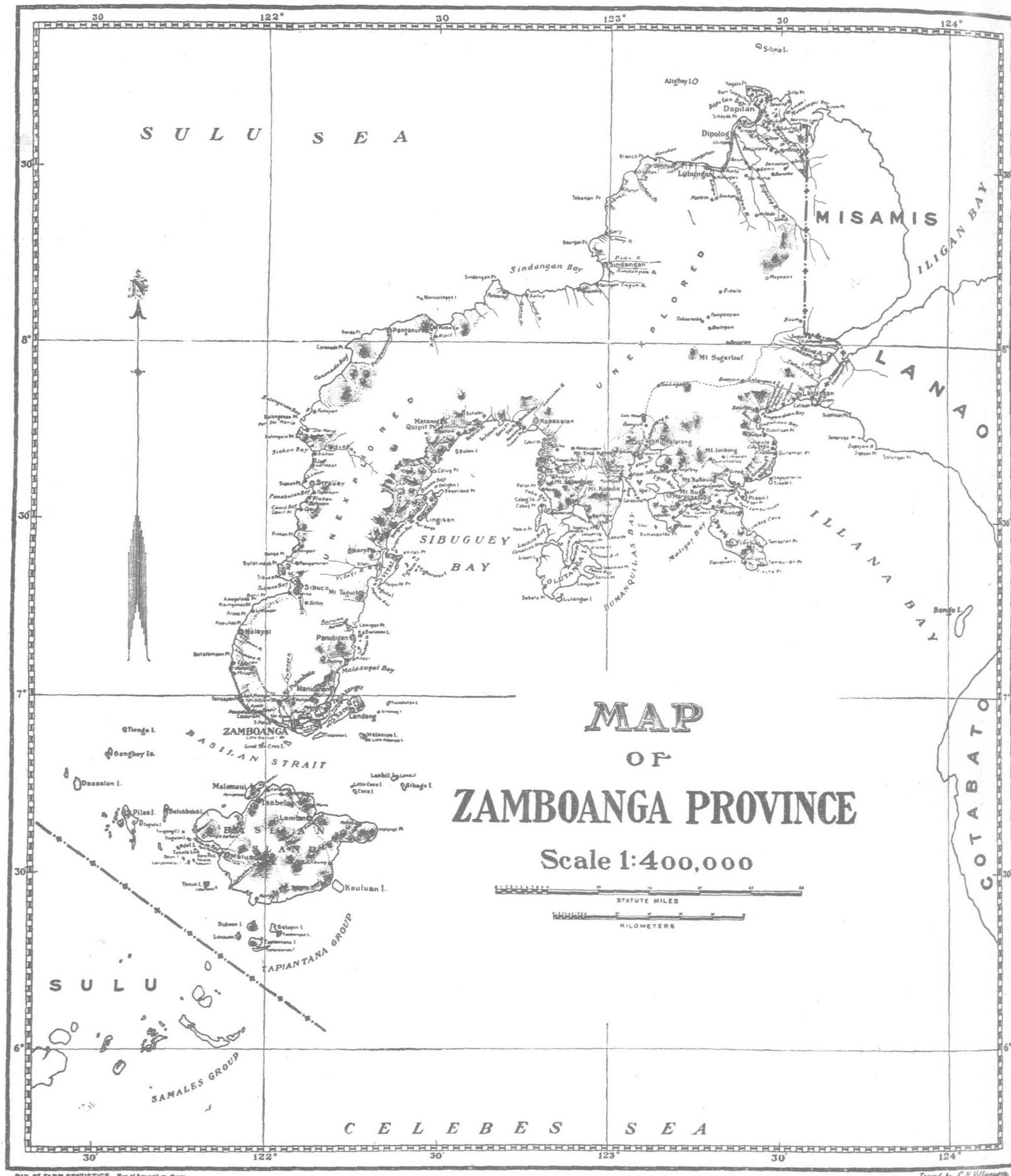
The marine products of Zamboanga include pearls and shells, the exports of which totaled P.81,943 in 1918. Small amounts of bêche de mer, shark fins, coral and sponges are also produced. Fish of excellent quality is plentiful in the markets at all times of the year. Salt is produced in Talontalon near Zamboanga for local consumption.

### Zamboanga, the Capital

Zamboanga is the capital of the province which it has given its name.

With its balmy climate, clear, limpid skies, brilliantly blue water, the wonderfully colorful sunsets over the vast expanse over





the sea, the opulent vegetation, its tall, waving coconut palms, shady streets, and effects in decorative landscape gardening not forgetting turbaned Moros gay in their habiliments of bright colored cloth, the city of Zamboanga possesses a charm quite foreign to the seaports to the north in the Philippine archipelago. Violent storms are rare. So different from the islands in the north is, indeed, the general atmosphere of Zamboanga that here one might imagine oneself in a foreign country, more akin to Java and all that name implies.

### Transportation and Communications

For connection with the outside world Zamboanga is served by several steamship lines. The Nippon Yusen Kaisha steamers plying between Yokohama, Hongkong, Manila and Sydney make Zamboanga a port of call. All inter-island steamers from Manila to Jolo, Cotabato and Davao, such as the *Islas Filipinas*, *Yazoo*, *Neil MacLeod*, *Albay*, *Fernandez Hermanos*, *D. Idefonso*, *Mindanao*, *Raritan* and others call at Zamboanga on their way



to and from Manila via Cebu and Dumaguete. The *Tablas* provides monthly communication with the north coast of Mindanao as far as Butuan, touching at all the important points, such as Dapitan, Dipolog, Misamis, Kolambugan, Iligan and Cagayan, and at the less known points whenever there is sufficient cargo to warrant a stop; on the south coast calling at Cotabato, Lebak, and the Davao ports as far as Mati, and making occasional trips to Jolo, Cagayan de Sulu and Siasi, which as a matter of fact, is also done by the *Mindanao*. There are also steamers plying monthly between Zamboanga, Borneo and Singapore. Direct connection with Iloilo and other insular ports not mentioned is erratic and irregular and as a rule travel there from Zamboanga must be made via Manila. The U. S. army transports arrive monthly from Manila. Large and small launches handle the inter-provincial trade, while many sailing vessels touch there from domestic and foreign ports.

Zamboanga has direct cable communications with Basilan and Jolo, and with Manila via Cebu and Dumaguete; it also has a wireless station. The Zamboanga telephone system extends to San Ramon and Patalon on the one coast and to Manicahan and Buena Vista on the other. Dapitan is also connected by a cable with Cebu, and a local telephone system links up the settlements in the northeast corner of the province with each other and with the adjoining part of Misamis province.

A first class road has been constructed from Zamboanga to San Ramon on one hand and to Manicahan on the other, and a second class road is under construction from Isabel to Lami-tan. Transportation between the different municipalities in the province is consequently almost entirely by water on the sea coast.

### Trade

The foreign exports of the port of Zamboanga during 1918 amounted to P.498,187, while the domestic exports amounted to P.2,798,723, the bulk of which consisted of copra, lumber, abaca, marine shells and rubber, in the order named. According to the annual report of the bureau of customs the foreign imports for the same year amounted to P.1,354,051. These figures do not, however, represent the total imports and exports of the province. There were 44 entrances and 35 clearances of foreign vessels during the year, while 804 and 827 coastwise vessels entered and cleared respectively.

## Foreign Trade of Japan for First Six Months of 1921

"JAPAN'S foreign commerce in the first six months of the present year registered roughly a 50 per cent. decrease in both exports and imports as compared with the corresponding period of last year," says American Consul Lester L. Schnare, Yokohama, in *Commerce Reports*. "One of the most radical factors noticed in all branches of trade is the decline in prices causing the whole trade to look very unfavorable. The decline as noticed in the volume of trade is not so notable." Thus the ministry of agriculture and commerce characterizes Japan's external commerce during the six months just ended in its semi-annual report, says the *Japan Advertiser*. The total value of Japan's external commerce during the six months reached Y.1,372,635,000 (\$684,258,547), according to the report, of which Y.574,817,000 (\$286,546,274) was exports and Y.797,818,000 (\$397,712,273) was imports. The excess of imports over exports amounted to Y.223,001,000 (\$111,165,999). Compared with the corresponding period of last year the exports show a decline of 49.5 per cent. while the decrease in imports reached 50.6 per cent. The decrease in the total was 50.2 per cent. Every month's trade registered a decline both in exports and in imports, the rates of decrease ranging between 33 per cent. and 6 per cent.

A comparison of the six months' trade of 1921 with the corresponding pre-war period of 1914 follows:

			January-June, 1914.	January-June, 1921.
Imports	...	...	\$190,792,899	\$397,712,273
Exports	...	...	155,566,396	286,546,274
Total	...	...	346,359,295	684 258,547
Excess of imports over exports	...	...	35,226,503	111,165,999

As shown in the foregoing statement, the imports show an increase of 108 per cent. over the pre-war period and the exports an increase of 84 per cent. In the total there was an increase of Y. 677,831,000 (\$337,899,252) or 98 per cent.

### Trade Declines with Various Countries

In trade with Asiatic countries exports fell off 41 per cent. and imports 56 per cent. Japan's European trade fell off 84 per cent. in exports and 13 per cent. in imports. The North American commerce registered a decline of 53 per cent. in exports and 51 per cent. in imports. In the case of the South American trade the decrease in exports amounted to 86 per cent., while the decrease in imports was 93 per cent. In the Japanese-African trade exports decreased 83 per cent. and imports 92 per cent. In the trade with other countries, exports dropped 61 per cent. and imports 66 per cent.

When trade is examined in relation to individual countries, it is found that both exports to and imports from Germany and imports from the Straits Settlements, Siam, Belgium, Austria-Hungary, Russia, Portugal, Mexico and Peru registered gains, while the exports to and imports from all other countries in the world diminished more or less noticeably.

### Representative Export Commodities Showing Decreases

In the export trade of the six months only two of 28 representative commodities registered an increase. They were copper and beer, the former showing a gain of 62 per cent. and the latter 16 per cent. Below are given in the order of their relative importance to the total trade the 26 leading articles of export registering a decrease and the rate of this decrease for the last six months:

	Percentage of decrease.		Percentage of decrease.
Raw silk	40	Beans and peas	82
Cotton cloth	37	Tea	83
Silk cloth	58	Buttons	69
Cotton yarns	34	Coal	17
Refined sugar	72	Starch	96
Cotton hosiery	72	Hats and caps	77
Matches	62	Woolen cloth	78
Braids	80	Paper	19
Waste silk	78	Iron	61
Lumber	56	Portland cement	35
Glass and glassware	68	Leather manufactures	60
Toys...	71	Rice	37
Porcelain	42	Zinc	84

When the export prices of the more important articles are examined it is discovered that the average export prices were higher only in beer and rubber tires. In other articles the average rate of decline is 33 per cent. In some leading articles on the export list, such as raw silk, silk cloth, cotton yarns, and others, the decline in the average export prices is more than 50 per cent. This shows that the decline in the prices of individual commodities was one of the most important factors of the export trade of the term.



# A Model Textile Factory in China

By VERNE DYSON

**F**ROM the standpoint of engineering excellence, the cotton mill of the Heng Yuen Textile Company in Tientsin is noteworthy among China's latest industrial acquisitions. There is in this establishment an entire absence of all inefficient old-style methods and equipment. The factory sets a new standard in that it is modern in every particular in its housing, power plant and in all mechanical departments.

The first unit of the mill was built three years ago. There have been several additions, making a total of 30,000 spindles and 200 looms. The company, capitalized at \$5,000,000, is a private cor-

all cotton cloth, and its chief demand is for making large army tents and sails for the larger junks and other sailing vessels.

A general view of the mill from the outside reveals a compact series of one-story concrete buildings with rooves of the late saw-tooth style. The advantage of this sort of roof is that it gives an uniform distribution of light to all machines. The one-story type of buildings also afford a direct route for the passage of the cotton from the raw state in the bale through the process of becoming yarn, and on to the final finished cloth product without any carrying up or down stairs. The one-story factory building has advantages in its ventilation and other healthful features. While



H.E. Tsao-Jui

Governor of Chihli Province, President, Heng Yuen Textile Co.



J. T. Chang, Esq.

Promoter and Vice-President, Heng Yuen Textile Co.

poration, founded and controlled by government officials. The president is H.E. Tsao Jui, civil governor of Chihli province. Mr. J. T. Chang is vice-president. The mill manager is Mr. J. M. Wang.

The products of the mill are sheeting, drills, light duck and heavy canvas. It specializes in the latter and in this field it is supreme, for there is no other mill in China which makes heavy cloth in quantity. Sheeting is used by the bulk of the Chinese race for its every-day clothes. The cloth is manufactured mostly in grey, and the retail consumer dyes it to suit his taste.

Drill is a firmer cloth than sheeting and, consequently, is higher in price. Most of the mill's output of light duck and canvas is purchased by the Chinese government.

Light duck is needed by the government for army tents and for cartridge belts for the soldiers. This is the cloth which is used also for upholstering and in making tops for rickshaws and the sails of small craft. Canvas, or heavy duck, is the strongest of

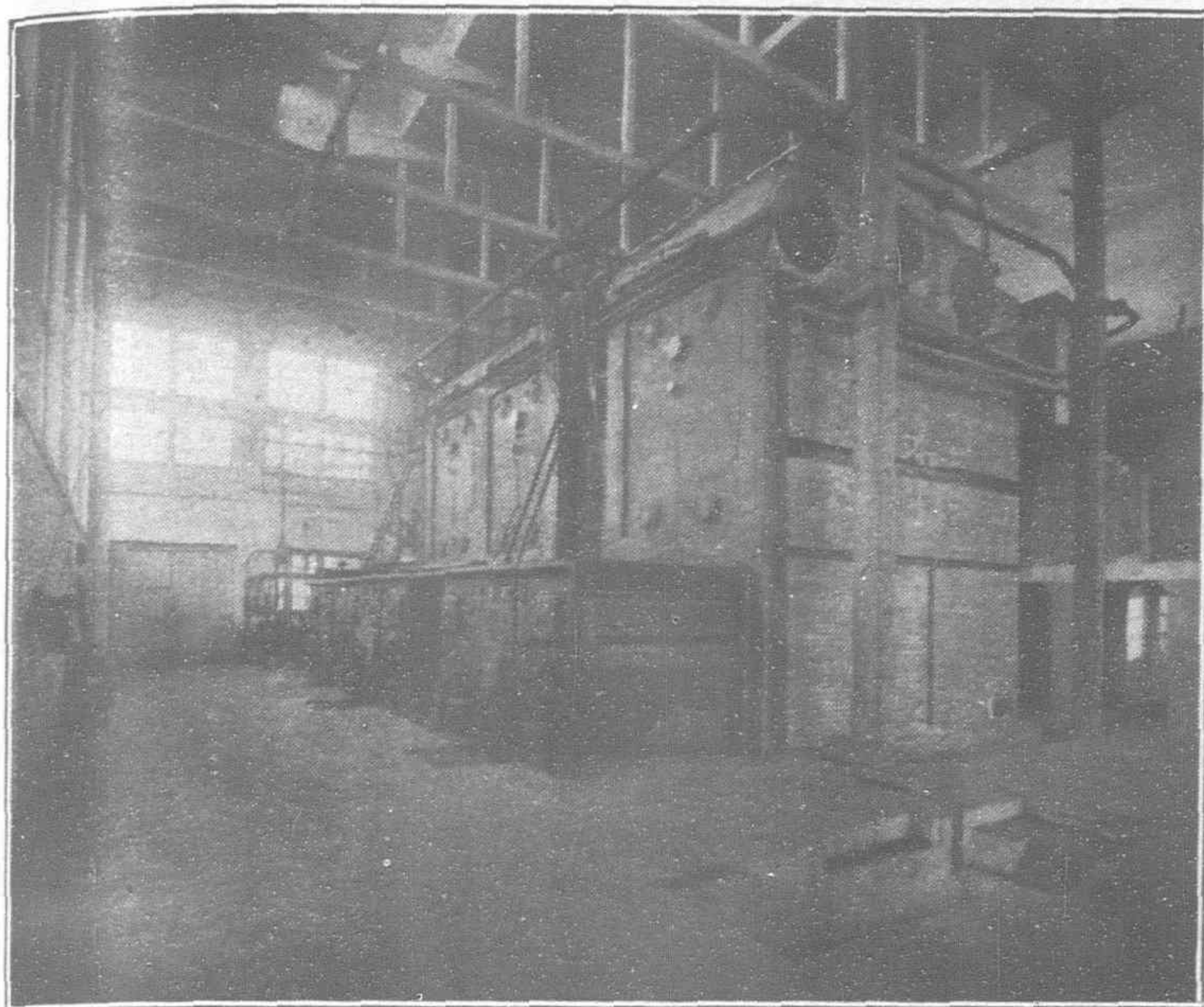
the single story structure is recognized as the best for factories, it is not always possible to follow this design in such places as Shanghai where land prices are high.

The complete equipment for the factory was furnished and installed by Andersen, Meyer & Co. In the power plant the General Electric Co.'s equipment was used throughout.

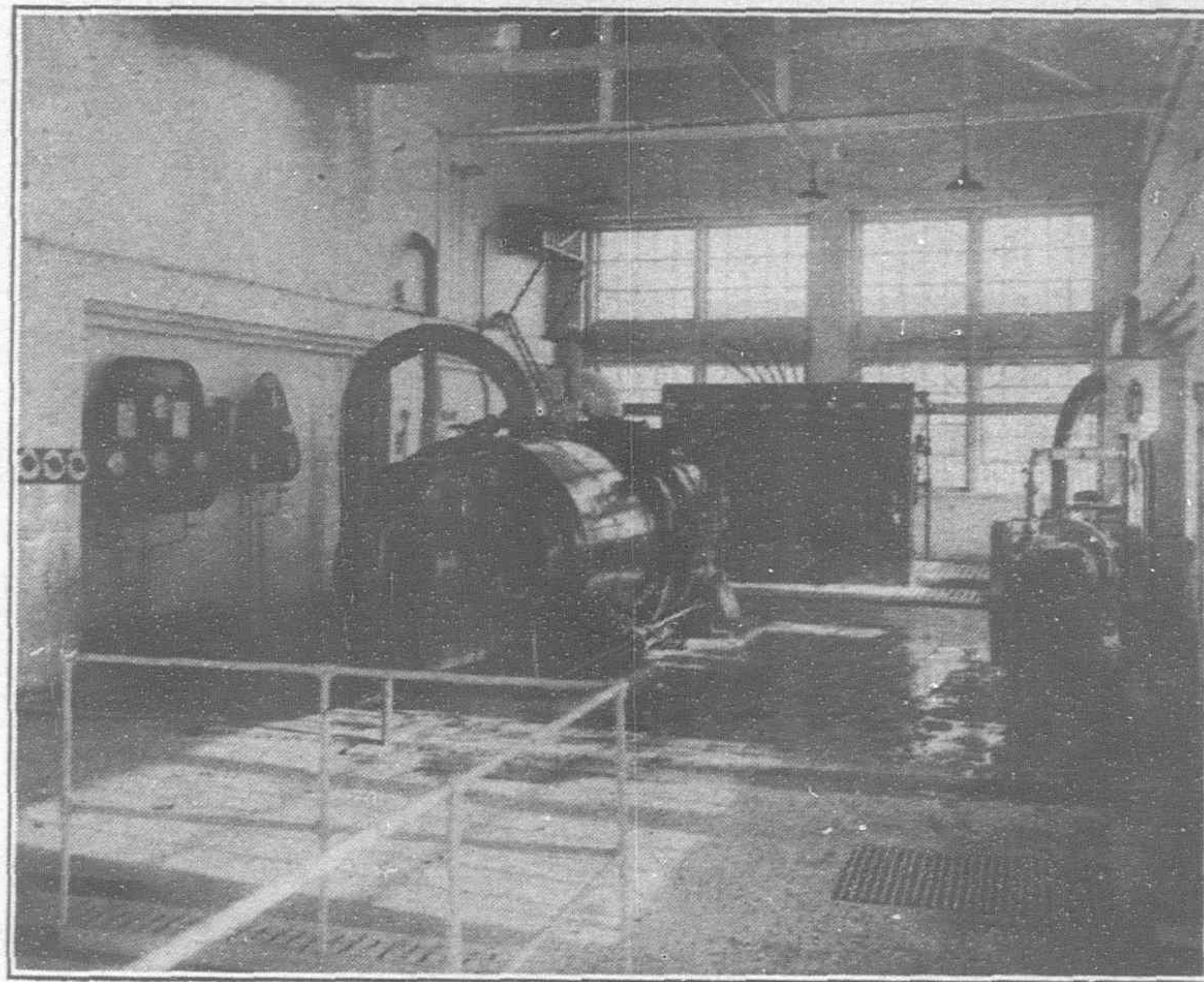
The power plant has a present capacity of 750 K.W. with 1,250 K.W. under construction. The power plant reaches a high ideal for it is isolated, well balanced, economical and develops electricity exclusively for the mill.

The vacuum system contributes extra efficiency to the steam turbine drive. The condensation of the steam into water produces the vacuum, giving to the turbine blades an extra high pressure. An "important minor detail" is found in the treatment of the steam pipes, which are scientifically covered with non-conducting material to prevent the leakage of steam through the joints.



**Turbine Room**

Present installation 1-750 K.W. General Electric Curtis Turbine

**Boiler Room**  
Auxiliary Equipment

All the electrical standards are according to American usage, with 110 volts for lighting and 550 volts for power. All electrical wires are enclosed in flexible steel conduits, made by the Sprague Manufacturing Co.

In following the course taken by the cotton, a tour of the plant starts in the picker room. Here occurs the preliminary processes of spinning. The picker room has three functions:

- (1) The opening of the cotton. In the bale cotton is compressed until it almost solid.
- (2) The cleaning. All foreign matter—dust, grit, twigs, etc.—must be removed.
- (3) The making of the cotton into lap form.

In the picker room there is a noticeable improvement in the manner of transporting cotton from the bale breaker to the bins by means of galvanized iron pneumatic tubes. The old method of using wooden lattice conveyors, common in China, constitutes a serious fire hazard.

As a matter of conservation, the picker room is provided with special machinery for converting waste cotton and yard back into

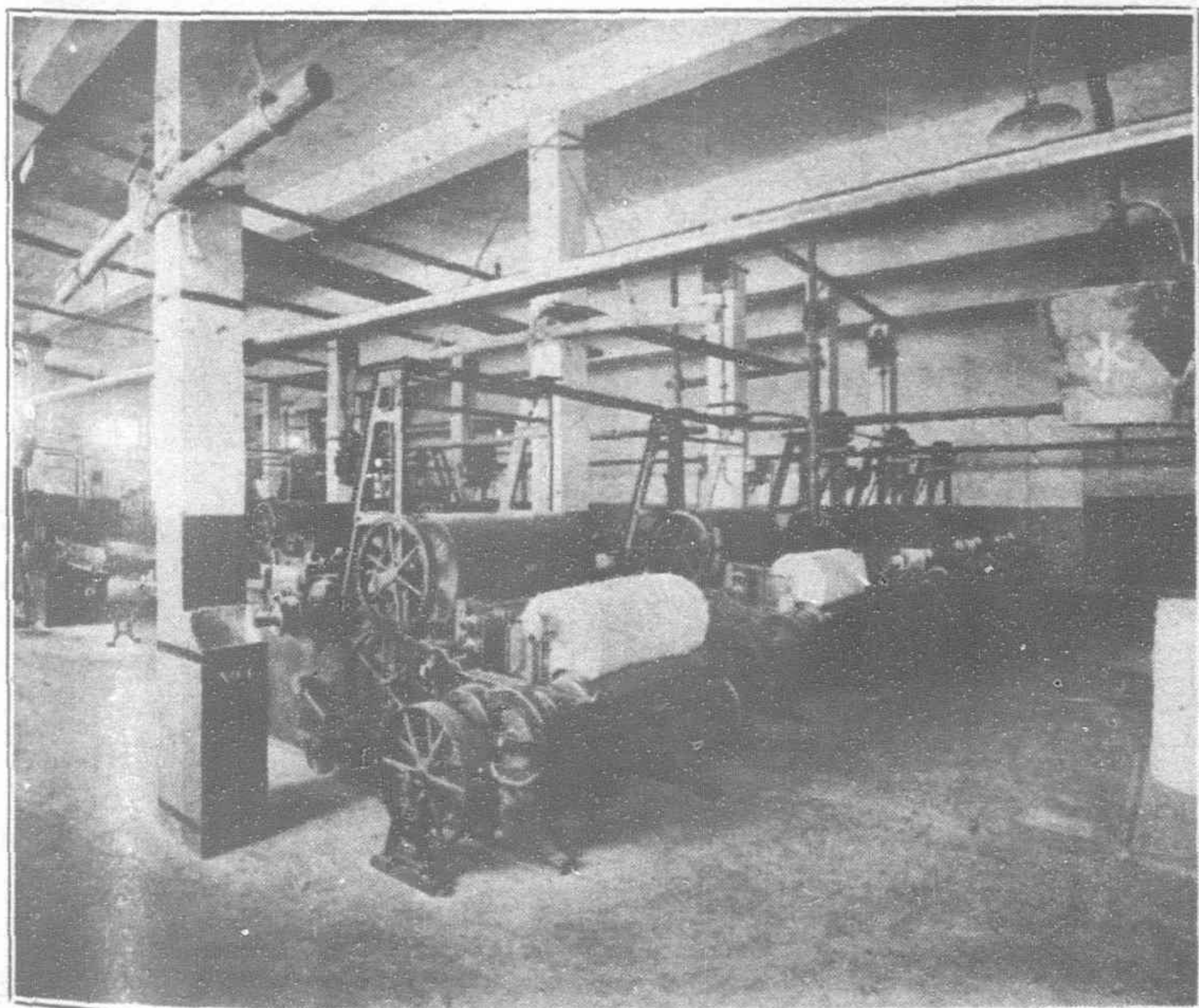
the original fibrous condition and mixing it with good cotton. The machinery in the picking room was made by the Kitson Shops of Lowell, Mass., which are controlled by the Saco-Lowell Shops.

The carding room next. Here Mr. Z. T. Zia, textile engineer for Andersen, Meyer & Co., who is conducting the tour, points out an important characteristic. It is the overhead humidifying system. To the novice it would appear to be an ordinary fire sprinkling system, but it is different. Each of the little "sprinklers" is an atomizer, operated by compressed air. By means of the ducts, the air in the room is kept in a moderately damp condition. Cotton handles better if it is slightly damp.

In the carding room the cotton first goes to the carding machine proper. The card is considered an important department of the mill for here the cotton is deprived of the last particle of foreign matter, and is reduced into rope form.

The second process begins in the drawing frames where six of the cotton ropes from the card are combined into a single strand, which makes the "roving" much more even and places the single cotton fibres side by side.

#### PHOTOS TAKEN AT THE HENG YUEN TEXTILE CO.'S MILL

**No. 1 Picker Room****Spinning Room**  
General Electric Co.'s Motors used throughout entire Mill



At the third stage, the cotton roving goes through three successive machines by which it is drawn finer and finer to the required size for the next process—spinning.

Unmitigated evils of old-style factories are the shaftings and hangers. Particularly are they a handicap in the spinning room of a cotton factory, restricting the light and dripping oil on the floor.

Not a shaft or hanger is in sight in the spinning room of the Heng Yuen plant. Modern engineering has eliminated them completely. Here the spinning machinery is driven by electricity, with one motor for every four spinning frames.

The treatment of yarn in the Heng Yuen plant differs somewhat from that in most of the spinning mills in China. Since the finished product here is a heavy duck, or canvas, ordinary yarn is combined into ropes of three or four ply by the twisting machines.

From the winding and twisting department the reinforced yarn goes to the only reeling room in North China which is operated by mechanical power.

In the weaving department we found one hundred Draper sheeting looms, and one hundred Crompton and Knowles duck looms. This division is admirably lighted.

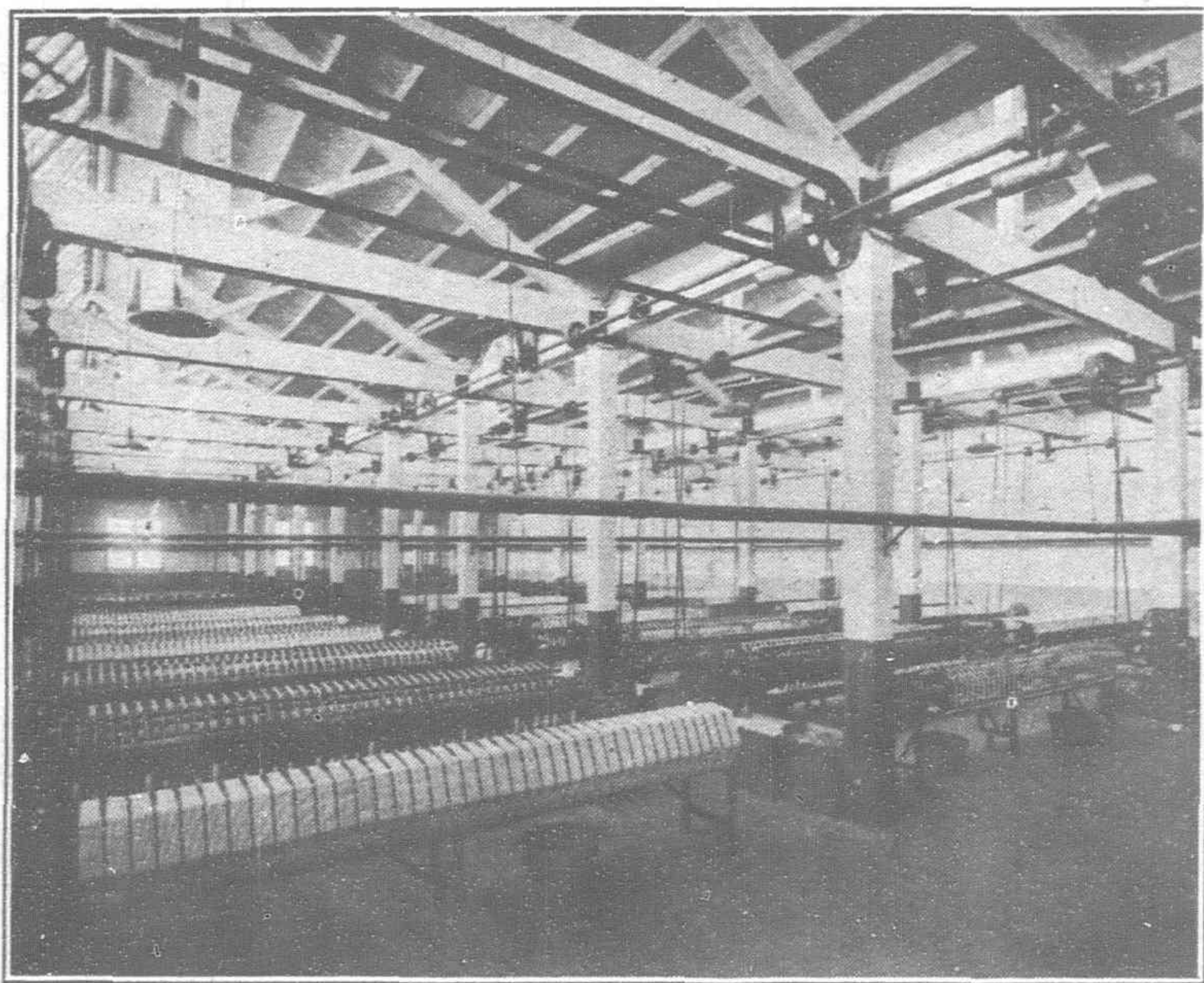
Now that the Heng Yuen factory has taken its place as an inspiring example of the best mill construction, questions are vanishing. Its influence for good is becoming recognized. It points out an important commercial fact which has long been recognized by the weaving industry in England and America: i.e., that the excellence and the economy of production depend on the right kind of mechanical equipment, rightly installed and rightly managed after it is installed.

The prominence of scientific engineering is noted in the different advancing industries. In this particular the Heng Yuen plant is distinctive among other Chinese cotton mills. From first to last, the factory is the product of experts.

Aside from the question of mechanical equipment, there is another encouraging characteristic in the mill's policy of specialization. Mr. Zia points out:

"At first most of the cotton mills in China produced only yarn. Recently, they have begun to follow the best practices in the mills of America and England, and are specializing. There was a marked shortage in the Orient of the heavier grades of cotton cloth—duck and canvas. This material was needed by the Chinese government in quantity for army tents and other military uses; also,

#### TWO VIEWS AT THE HENG YUEN TEXTILE CO.'S MILL



**Reeling Room**

The only reeling room in North China operated by Power

The Saco-Lowell slasher and sizing system is used. The sizing machine is an immense thing, towering up to the ceiling. In the cloth room, Curtis and Marble cloth room machinery is used.

While the Tientsin plant is not the largest or most expensive cotton factory in China, it is one of the most interesting of the country's 102 mills. The Heng Yuen factory is a gem of an industrial plant, in that excellence was striven for in every engineering feature, large and small.

From the inception of the enterprise, the question of expense did not stand in the way of obtaining the best of any particular equipment that the machinery market afforded.

At first some of the conservative Chinese capitalists in Tientsin were inclined to regard Governor Tsao and Mr. Chang, the promoters, as extravagant. Very frequently when an industrial plant has been established in China there has been an effort to save money at the expense of some one department. For instance, a mill promoter would buy the latest and best weaving machinery, and then install an old-style, inefficient power plant, or he would place modern equipment in a poorly-lighted building.



**Weaving Department**

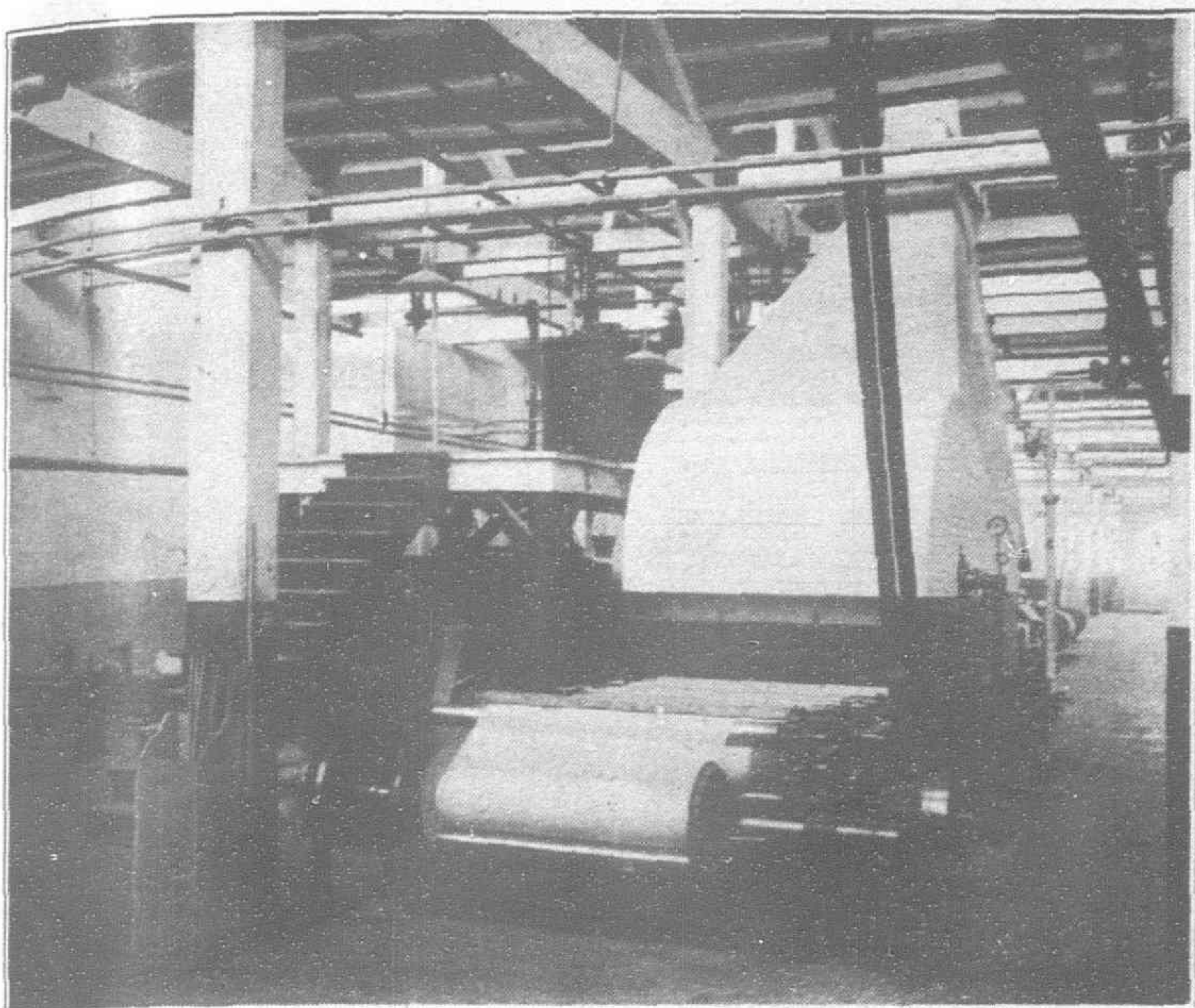
100 Draper Sheeting Looms, 100 Crompton and Knowles Duck Looms

it was greatly in demand to make sails for ships. Here was a well-nigh unlimited market waiting for a mill. The Heng Yuen Textile Company is improving this trade opportunity. It has specialized in duck and canvas. Consequently its products are sold before they emerge from the looms."

Conditions in China at the moment, viewed from the political and economic standpoint, appear rather hopeless. Observers are turning toward commercial development for optimism and are finding it.

"What greater faith in themselves or in their country could a group of Chinese show than in placing a capital of \$5,000,000 in an industrial plant, such as that of the Heng Yuen Textile Company?" a Tientsin taipan inquired. "The model plant is distinctive, encouraging and points a hopeful lesson for the down-hearted because—it stands for an idea that is spreading through China—the belief that national salvation and stabilization must come through improved commercial, financial and engineering methods, and let the tuchuns fight it out until they destroy each other and get out of the way of big business."





Saco Lowell Slasher and Sizing System  
Heng Yuen Textile Mill



Cloth Room at the Heng Yuen Textile Mill  
Curtis and Marble Cloth Room Machinery

## A Short History of Aviation in China

IN the second year of Hsuang-Tung of the Tsin dynasty (1910) the general staff at Peking selected a place about ten miles from the south suburb of Peking, known as Wu-Li-Tieng in Nanyuan, for establishing an experimental flying field. The plan of this work was a simple one and yielded little efficiency. In the same year a Russian pilot made a flying exhibition with a Bleriot monoplane at the legation quarter, Peking. In the next year Mr. Valoon, a French aviator, flew with a Sommer biplane in Shanghai. He unfortunately was killed by accident.

During the revolution of 1911 the revolutionary leaders planned to attack Peking from the air. They ordered two Etrich monoplanes from Austria which arrived at Shanghai in the following year when the revolutionary turmoil was entirely over. About that time Mr. Li Zu-yin, who had just returned to China from England, made several flights in Shanghai. While in Canton Mr. Feng Juh was accidentally killed in a flying exhibition. In 1912 Mr. Li brought the two Etrich planes to Nanking and finally moved them to Wu-Li-Tieng.

In the meantime the general staff established a flying school at Nanyuan (which is now known as the Nanyuan Flying School). For the flying practice of students, twelve Caudron biplanes were bought. A factory was also established for the purpose of repairing aircrafts. The instruction staff of the school consisted of a Chinese and a French instructor who were assisted by two French engineers. Later the aircraft factory was amalgamated with the school. Since then the aeronautical training for students has never been neglected in spite of the difficulties of the importation of aircraft materials during the European war. At the end of 1918 about one hundred students were graduated from the school, of whom fourteen had passed examinations in military aviation and had flown over a distance of four hundred kilometres. In military engagements aeroplanes were then in active use, such as in the suppression of the "White Wolf," the relief of Mongolia and the attempted Manchu restoration of 1917.

Early in 1916 the board of navy began to draw its attention to naval aviation. Accordingly the Fuchow Submarine and Flying School was founded in the vicinity of the Fuchow dockyard. Mr. Chen Shao-tsiang was in charge of the school. Its faculty consisted of several students who had returned from America upon completing flying training. As the school was near the naval bureau, the machines of the bureau could be easily put at its disposal. With this advantage the instructors made several sea-planes for training purposes. Unfortunately, the first plane, when tested, was wrecked owing to motor trouble.

In the winter of 1919 the aeronautical department was established to control all the air services of the country. Contracts were signed with the Handley Page and Vickers companies, by which the government promised to buy from the companies not less than 150 aeroplanes for training and commercial purposes and to employ foreign experts as pilots and instructors. In the spring of 1920, Colonel Holt, recommended by the British air ministry, was engaged as a technical expert to the department for a term of two years.

Prior to the fall of 1919 there were two organizations for air administration, one was the preparatory aviation bureau known as Han-Kung-Shi-Wu-Chu, and the other was the aviation department in the ministry of communications. In the autumn of 1920, however, both of these organizations were amalgamated by a cabinet order into the present aeronautical department.

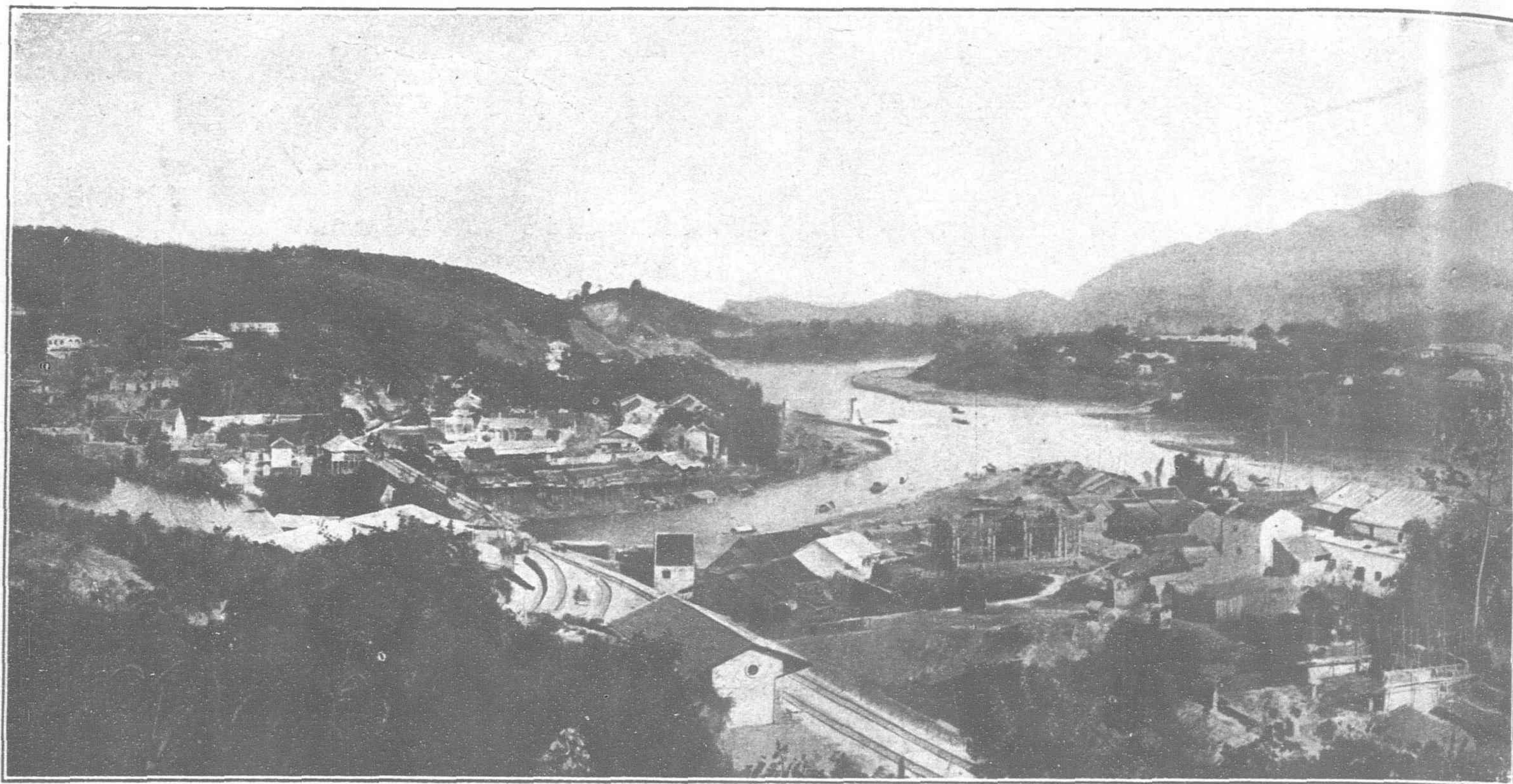
Since the reorganization of the aeronautical department, the administrative works have been increasing every day. While General Ting, the director of the department, controls all the affairs, its works are directly supervised by the premier. Two of its accomplishments in commercial aviation are worthy of notice, one the air route between Peking and Nanyuan, which was started on April 2nd, and the other is the establishment of the Peking-Shanghai air line, which will be completed when funds permit.

Progress is slow on the Peking-Shanghai air line, which consists of six sections—Peking, Tientsin, Tsinanfu, Nanking, Hsuechow and Shanghai. Between these different stations it is contemplated establishing several landing fields. Pending the completion of the airdromes at the above-named stations, the aeronautical department of China has established a school for air service administration in order to provide administrators for the airdromes. Students of the school are chosen from among the members of the aeronautical department and graduates of the Nanyuan School of Flying. The number of students is 30, and the courses of study which will be given them will embody only necessary and elementary knowledge in air service administration and will be finished in three months. After graduation the students will be sent to the different airdromes.

The Nanyuan aircraft factory has been removed to Tsin-Ho, and 20 Avros and 24 Vimy planes have been transported to the latter place for service in connection with the Peking-Shanghai air line.

The aeronautical department has issued an order to the effect that the flying personnel will be subjected to a medical examination every six months. The first examination this year was held in April.





Panoramic View of Laokay on the Indo-China-Yunnan Border, the terminal of the Yunnan Railway

## The Yunnan Railway

THE official report of the Yunnan Railway for the year 1919, recently published, shows that the receipts for the year from all sources was \$3,030,631.88 against \$2,791,978 for 1918, including the sums collected from the Chinese government for the transport of troops and military supplies, amounting to \$3,957 in 1918 and \$2,110 in 1919. Reduced to francs the receipts show 16,727,094 francs for 1919, and 11,945,777 francs for 1918.

If the normal tariff had been constantly applied, the receipts would have totaled \$5,515,729 in 1919 and \$4,235,594 in 1918, or an increase in 1919 of 30.2 per cent. over 1918, and an increase of 31.4 per cent. in that year over 1917. If it had not been for the important diminution of the tariff due to the enhanced value of the piaster, the increase would not have been so great, especially as regards the passenger receipts in Tonkin where the increased traffic returns are due, in the main, to the low value of the piaster.

*Passenger Traffic.*—The total number of passengers carried was as follows:

	1919.	1918.
1st Class ...	7,756	5,848
2nd " ...	14,106	10,919
3rd " ...	120,541	79,352
4th " ...	4,225,270	3,292,282

Total ...	4,367,673	3,388,401
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This shows an increase of 32.6 per cent. over 1918 for 1st class, 29.2 per cent. for the 2nd class, 51.8 per cent. for 3rd class and 28.3 per cent. for 4th class. An examination of the traffic movement shows following for the Haiphong-Laokay section of the line (the section the within Indo-China), as

	1919.	1918.
1st Class ...	7,367	5,548
2nd " ...	12,983	9,544
3rd " ...	110,527	64,204
4th " ...	3,131,834	1,946,495

Total ...	3,262,711	2,025,791
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which discloses an increase of 32.8 per cent. over 1918 for 1st class traffic, 36 per cent. 2nd class, 72.1 per cent. 3rd class and 60.9 per cent. 4th class.

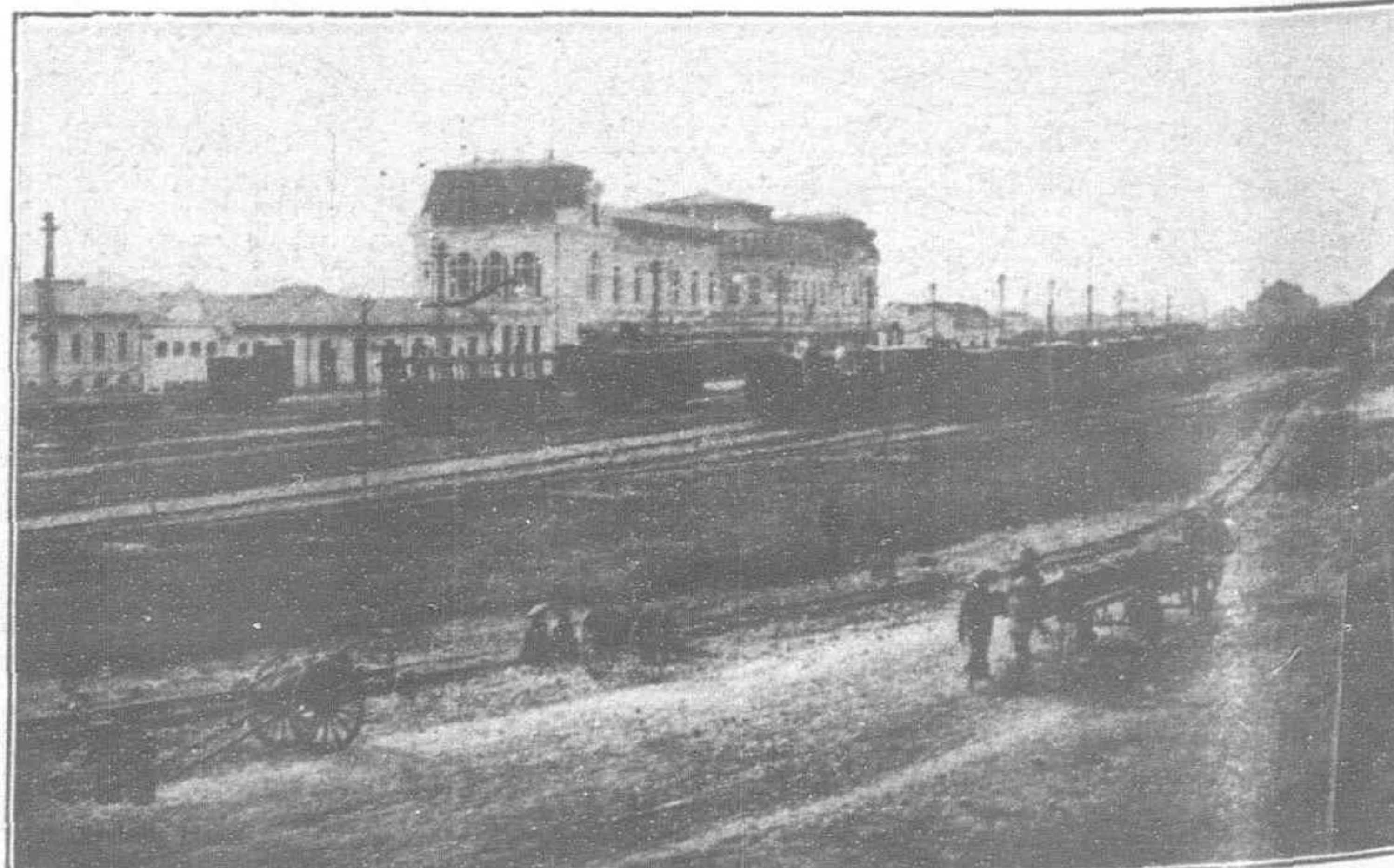
The traffic on the Hokow-Yunnan section, which traverses the Chinese province of Yunnan from the Red River to the capital, was as follows:

	1919.	1918.
1st Class ...	389	300
2nd " ...	1,123	1,375
3rd " ...	10,014	15,148
4th " ...	1,093,436	1,345,787

Total ...	1,104,962	1,362,610
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which shows an increase over 1918 of 29.7 per cent. in 1st class, a decrease of 18.3 per cent. in 2nd class, 33.9 per cent. in 3rd class and 18.8 per cent. in 4th class traffic.

This falling off in the Chinese passenger traffic is due to different causes, notably, the partial shutting down of the Kochio tin mines and the uncertain political situation, to brigandage, and also to the increase in the price of 4th-class tickets, which, for three months during 1919, was .0078 per mile, for five months .0071, and for two months, between .00585 and .0072, while during 1918 the tariff remained fixed for 11 months at .0048 and only one month did it reach .0078 per mile.



Railway Station at Hanoi, Tonkin



# Tropical Geology and Engineering in the Philippines

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THE purpose of the present paper is to discuss, first, the general geologic processes as they are found at work in the tropics, contrasting their effects with the same processes in the temperate regions of the earth; and second, to cite some examples showing their practical bearing upon the engineering problems that arise in those regions.

Previous to our experience in the Philippines, Cuba and Panama, Americans had had no extensive contact with the tropics and consequently many of our engineering data were found untrustworthy when applied to wholly new and unusual conditions. An especially good example may be cited in the location of our highways and railroads.

In the United States we run a railroad line up one cañon, over the pass, and down the other side by way of another cañon. This has been tried in the Philippines, notably in the Benguet Road; the result is that this road may have to be abandoned because of excessive cost of maintenance. In the tropics, during high water, there is room for but one thing in a valley and that is the stream which occupies it; such a feat of engineering as that which has made the Royal Gorge and the Denver and Rio Grande Railroad famous is absolutely out of the question in the tropics.

There is one cardinal rule to be laid down at the outset, namely, take nothing for granted; investigate each problem separately. Handbooks and set formulæ are worse than useless; they are dangerous.

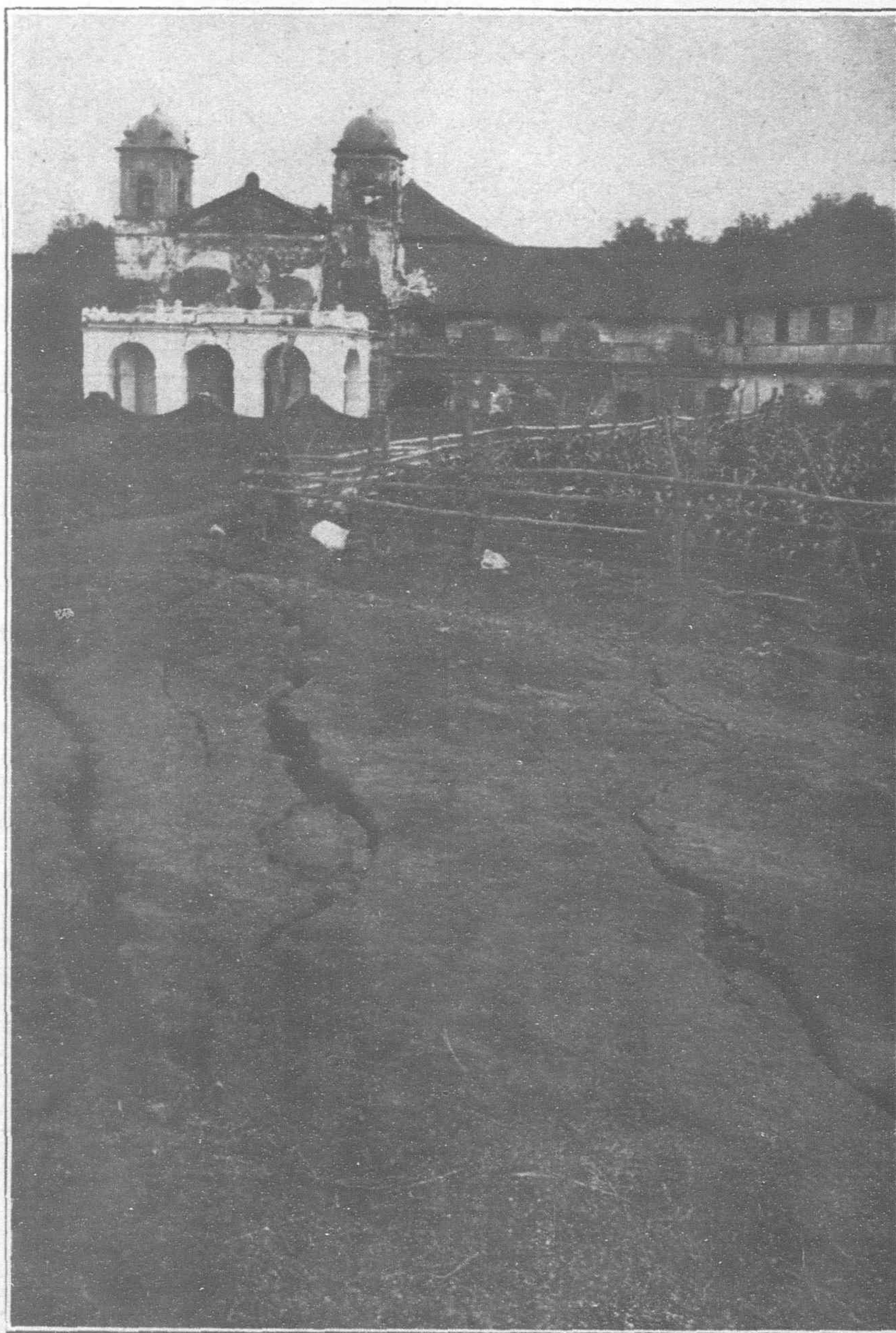
## Geological Agents

The three most important geological agents are diastrophism, vulcanism and gradation. The last has four important contributing factors to be considered; namely, *a*, weathering; *b*, transportation; *c*, corrasion; and *d*, corrosion.

*Diastrophism.*—The first of these, diastrophism, denotes the up-and-down movements in the outer shell of the earth. Such movements are negligible apparently in the older and more stable parts of the earth, but even there they occasionally manifest themselves as earthquakes. In the newer parts of the earth, and particularly along continental borders, they are of considerable magnitude and importance. As it happens, many of these places are in the tropics. This is true of both Panama and the Philippines. Once before, and perhaps twice, the barrier of the Isthmus of Panama, which has cost so much in life, labor and money to cut through, has been opened so that the waters of the Atlantic and the Pacific

intermingled, and it is not at all impossible that future diastrophism will render all our labor useless. However, these movements are so slow as to be almost negligible in any one generation. Only the geodesist finds that he has to readjust some of his calculations. We see the results in many parts of the world of such movements, but as yet we do not know much about them. Our data are not sufficient. Two facts are established, however; namely, that such movements as have taken place in the Philippines have been great during the late geological periods, amounting to as much as 1,800 metres, and that they have been differential. There has been within the recent period a marked tilting of the Philippine block toward the Pacific Ocean. This will explain to the engineer why we have comparatively shallow river mouths on the west side of the archipelago, and deep, drowned ones on the eastern side. It should be stated that in some parts of the archipelago, notably Cebu, the reverse is the case, which further substantiates the statement.

*Vulcanism.*—As the Philippine archipelago is a part of the so-called



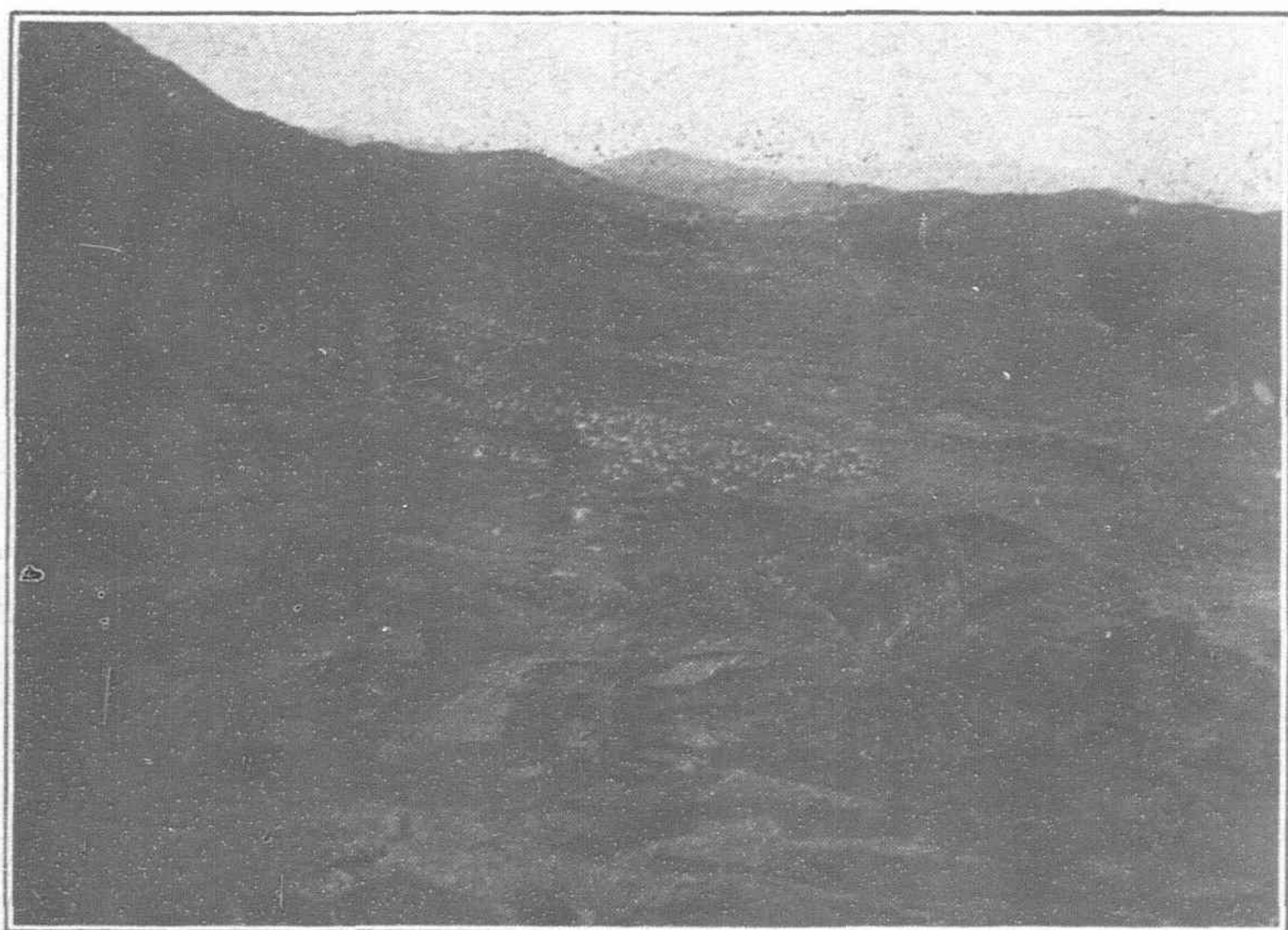
Fissure and Damaged Church at Taal, Batangas Province



"Circle of Fire" that girds the Pacific Ocean, we naturally expect vulcanism to be of such magnitude that engineers would be continually anxious. Nevertheless, except for those regions in the immediate vicinity of active volcanoes, little damage has ever been recorded from this cause. The most-marked effects were those noted in 1911 resulting from the explosive eruption of Taal Volcano, situated about 45 kilometres due south of Manila. Had there been a large city (the size of Kingston, Jamaica, for example) situated on the shores of Lake Bombon, tremendously greater loss of life and damage might have occurred. The town of Taal, a few kilometres distant, suffered to the extent that an old church made of volcanic tuff was badly disfigured and a triangular section of land, crossed by one of the government's new highways, dropped about a metre, allowing the tide to come inland for perhaps four-fifths of a kilometre. The length of damaged road amounted to about 3 kilometres. These effects were due directly to earthquakes and indirectly to the volcano. Although four hundred ninety-eight distinct shocks were recorded in Manila at the time of the eruption, practically no damage there was noted. The claims of a certain American firm dealing in a patent type of concrete construction, that none of its buildings had suffered any damage at the time, were strictly correct, for no buildings in Manila were damaged!

Another instance in which vulcanism did play an important part was that in which a section of road in Albay province, Luzon, was obliterated for a distance of 3 to 5 kilometres by a fall of bombs and a deluge of mud and ashes from Mayon Volcano in 1915. As volcanic activity in the recent period in the Philippines has been entirely of the explosive type in which no lava outpourings occurred comparable to those from the Hawaiian volcanoes, the damage resulting to public works would be of very different character and also less serious.

*Gradation.*—This is the sum total of the wearing-down process, in many respects the dominant type of geological work. If we analyze this process we find that the following agents are contributory: *a*, weathering; *b*, transportation; *c*, corrosion; *d*, corrasion. I would, however, make "corrosion" a subheading under weathering, there being two factors involved; namely, a mechanical deformation and a chemical change, either of which may precede the other. Once weathering, or to use a very crude term defining it in part only, "slacking," has taken place, transportation comes in and does its work; and then "corrasion," or mechanical wear, becomes operative, but not until there is movement.



Town of Balugan seen from the Train. Balugan, Bente

Of course, these factors are operative in all countries and under nearly all conditions, but gradation proceeds at a maximum rate in the tropics. Two reasons are given for this; namely, rainfall and temperature or, in a word, climate.

In the Philippines we have a mean annual rainfall of well over 2,540 millimetres (100 inches), with sometimes exceptional and almost unprecedented precipitation, notably 1,168.1 millimetres (46 inches) in twenty-four hours on July 29, 1911, at the



Osmona Water-works; site of dam., Sebu. After Baguio

Baguio Observatory. This is, as far as we know, the world's record for a single rainfall. The reported rainfall of 23,387 millimetres (905 inches) a year at Cherraponji, in Assam, has lately been questioned. However, a precipitation of over 15 240 millimetres (600 inches) has been recorded on Mount Waialeale, Kauai Island, H. T. At such times the streams leave their banks and spread out over the country in sheets of water. Needless to say, the amount of material then transported is almost unbelievable. Furthermore, we have another factor to consider, and that is velocity. Often this is not taken into consideration. When we stop to consider that doubling the velocity of a stream means increasing its transportation power sixty-four times, we realize what a power we are trying to combat. We shall return to this topic.

Once the tropical downpour of warm rain has stripped off the soil, weathering can and does strike deeper into the core of rocks beneath, and however far we go underground in mine workings we find the rocks exhibiting incipient decomposition. The writer knows this to be true from the examination of a great many thin sections of wall-rock from the deepest mines in the archipelago. Undoubtedly the presence of organic acids, resulting from the decay of the rank tropical vegetation, hastens this decomposition. Of course, we have little or no frost, except in the highest mountains, but we do have wide ranges in temperature during the twenty-four hours and this adds to the disintegrating forces at work. Therefore, all things considered, we have reason to think that gradation, which includes degradation, is the most potent of the geologic processes at work in the tropics.

This excessive weathering in tropical regions, where andesite and basaltic lavas are to be found, has resulted in places in the accumulation of a formation, of considerable thickness, known as laterite. This is an aluminous soil or heavy clay, also rich in iron. When the iron exceeds 35 per cent. it can be used as an ore. Vast deposits of laterite are known in India and Cuba, and some years ago an American engineer discovered a commercial deposit of this in northeastern Mindanao, in the Philippines. A study of this deposit shows that it is a product of weathering and concentration.

*The Work of Organisms.*—Nothing has been said as yet about the destructive work of plants and animals in the tropical regions, as the writer has made little personal study of the subject. There is no question but that they play no inconsiderable part in the processes of weathering and on occasion have to be reckoned with in engineering operations. We have but to call attention



to Branner's \* observations on the geologic work of ants in Brazil to remind the reader of the importance of these insects. Not only do their numerous mounds, in some cases exceeding 5 metres in height, considerably alter the topography, but they seriously undermine the subsoil so as to endanger structures. They promote weathering by opening the formations to the atmosphere and to gases. The writer has seen many ant hills in the Philippines, but none commensurate with those in Brazil, described by Branner.

The writer's attention has just been called to the very interesting investigations of Oshima † on Formosan termites wherein he states that *Coptotermes formosanus* secretes a milky, acidulous fluid which dissolves the lime in the mortar of brick buildings. In order to protect the buildings he advises the construction of a concrete basement floor which shall have as few seams as possible.

It also appears from such studies as have been made that certain termites occupy in the tropics a place analogous to that filled by the common earthworms in temperate regions.

An instance of the work of winds and plants in combination may be of interest. In the recent destructive typhoon which struck Manila with such force (September 1, 1920), a great many of the fine acacia trees, which are the principal shade trees of the city, were uprooted and many sections of cement sidewalk were badly damaged as a result. These trees have widely ramifying and very shallow roots, with no tap-root; consequently, with their wide-spreading tops, they became easy victims of the storm.



A Street, Mangaldan, Pangasinan

**Corals.**—The role that corals and coral reefs play in matters of engineering and the economic development of a country cannot be overlooked. We have already alluded to the connection between coral formations and water supply. Coral limestone is a very important source of construction material. In certain other ways coral formations are of great importance. For instance, the fringing reefs protect the shore from storm waves; also, they afford a firm foundation for future land when covered with earth, either naturally or artificially. Most of the coastal plain tracts in the archipelago have a coral foundation which is much more stable than is mere alluvium.

### Structure

Much has been written in the textbooks about structure, and most engineers are probably cognizant of the importance of this branch of geology, but as yet little has got into the literature concerning this subject in tropical regions. Naturally an engineering feat of the magnitude and importance of the Panama Canal would necessitate a most careful regard for anything which might have an effect upon both the task of construction and the permanence of the canal. It is not the writer's intention to allude to any of the work of the canal commission geologist ‡ further than to advise any engineer who is working, or expecting to work, in tropical regions to give this important work considerable study.

In the Philippines we have the same sort of structures found in many parts of the world with the difference that here some of the structures are not only of recent origin but are still in the making. Where dynamic forces are at work the engineer cannot afford to be off his guard or ignorant of how they are to be recognized. The builders of the Los Angeles (California) aqueduct have very wisely studied and provided against the possible breaks which might interrupt that system, having been forewarned and forearmed by a geological study of the region, a region traversed by long parallel faults in the strata.

**Faults.**—In the Philippines there are many faults, some large, some small, which every mining man knows about. Does the civil engineer know about them? Can he recognize them? Are they old ones where movement has long since ceased or are they fresh and is movement likely to recur, and how will that movement be manifested? Which part will move up and which down? Is the fault normal or thrust? It makes a great deal of difference which. It can be readily seen that when it comes to railroad tunnels and water mains this becomes a serious matter. Cebu Island, for example, is apparently broken by a number of faults of considerable size, and it is the belief of some geologists that the straits between Cebu and Negros Islands are due to a down-faulted block of rock strata. Therefore, the construction of engineering works of any size on that island should be preceded by careful geologic investigations. As yet the writer knows of no engineering projects in the islands seriously affected by faults.

During a recent geological examination of the area in the vicinity of the Montalban reservoir, Dr. R. E. Dickerson suggested to the writer the possibility of a large fault traversing it. If further detailed study of the region should reveal such a break, it would be of the utmost importance to the citizens of Manila to know it. Possibly, this could not be worked out in less than several weeks, but whatever the length of time necessary, it would be justifiable.

All faults in the Philippines which the writer has seen are, with a few minor exceptions, of the normal type. Thrust faulting

may be present.

**Joints.**—One of the commonest features of rock formations is jointing. The cleats in coal may be considered as jointing on a small scale. Any quarry man is of course familiar with the great, regular, smooth-walled cracks which traverse various formations for long distances and more or less in definite systems. These are both an advantage and a source of trouble. Farther on the writer calls attention to the part these play in the building of the Benguet road.

**Folds.**—The importance of folds in the strata, such as the syncline (basin) or monocline in the case of artesian water and the anticline (arch) in the accumulation of oil, is well known to most people nowadays; but has it occurred to many people that the ease of excavation, or the control of water, causing flooding, etc., are dependent upon the attitude of the formations? In the Philippines we have the rock strata in all conceivable attitudes, each locality presenting different conditions which must be studied locally. Of course, in this respect the Philippines and the tropics in general do not differ from many other parts of the world. How-

\* Branner, J. C., Bull. Geol. Soc. Am. 21 (1910) 449-496.

† Oshima, M., Formosan Termites, Philip. Journ. Sci. 15 (1919) 319.

‡ MacDonald, Donald F., Bull. U. S. Bur. Mines 86 (1915).



ever, owing to excessive vegetation and weathering these important structural facts are often concealed even from the trained eye of the geologist.

### Special Problems

*Road Building and Maintenance.*—In parts of the tropics, and particularly in the monsoon region of southeast Asia, the seasons are sharply defined, one of practically no rain and one during which it rains in torrents. If we recall the rule that the carrying power of a stream varies as the sixth power of its velocity, we know at once we cannot take any chances with a tropical torrent. In regions of high relief we have four things to consider, and we cannot neglect any one of them. They are: Declivity or head, sudden increase of volume due to configuration of the valleys, the angle of slope of valley walls, and material and structure of the valley walls.

The writer has seen instances where the highway was placed in a valley at such a point that the road was continually menaced by the stream just below it and by the sliding of material from the slopes above. The stream is dangerous because of two things: First, because of the sapping of the water itself; and second, because, when the velocity is doubled, it can carry particles of rock sixty-four times as large as before, and in time of freshets boulders weighing tons are carried along, each one acting as a battering ram. No retaining wall can be expected to withstand this terrific bombardment, nor does it do so.

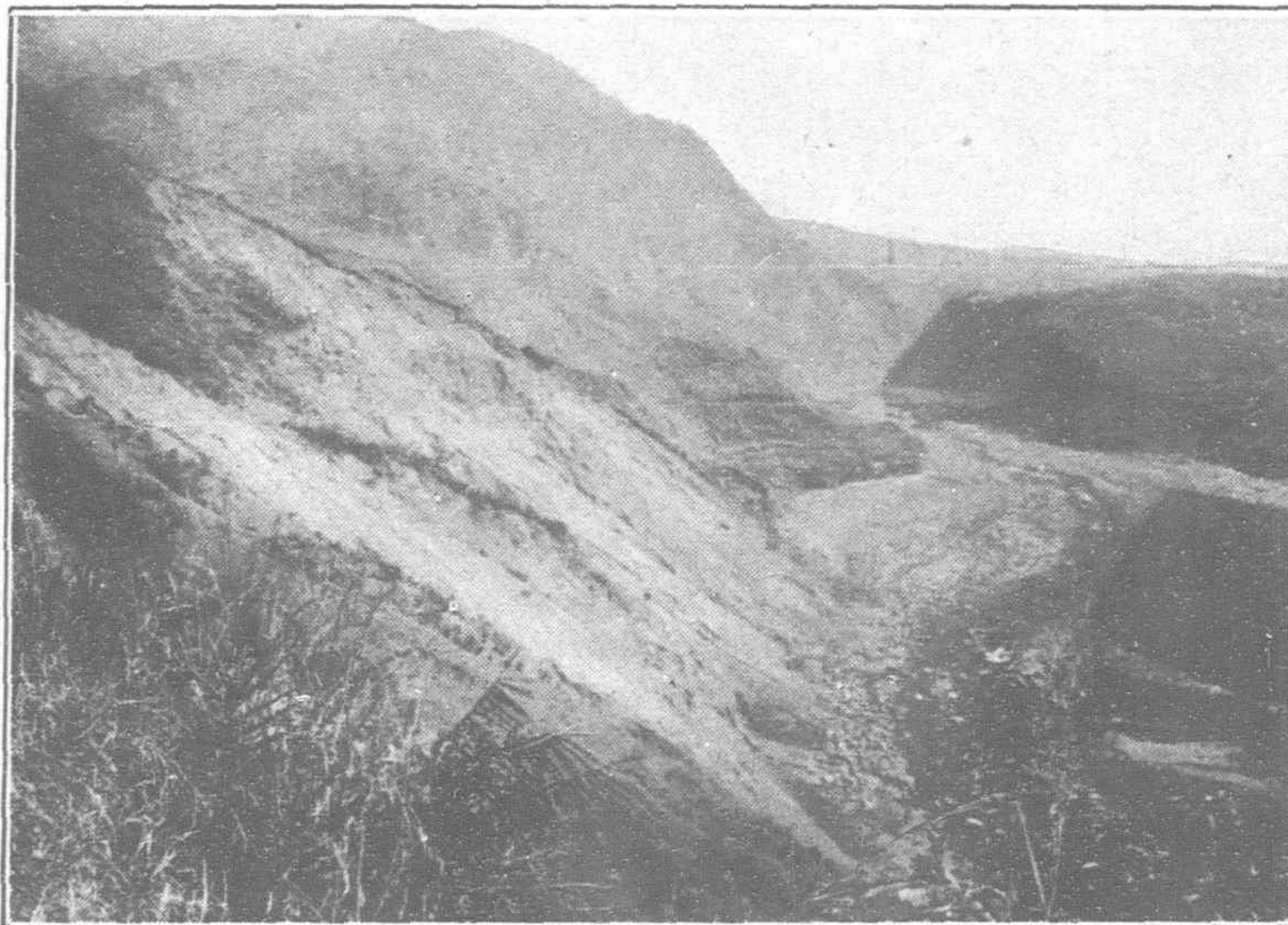
Again, the composition of the country rock, its structure, texture and the state of weathering are of vital importance; and, if this weathered material slides into the cañon below, a temporary and very dangerous dam results. When the dam breaks, as it soon must with the impounding of the torrent behind it, all is swept before it. We have a remarkable example of this in the now famous Benguet Road on Luzon Island. Bued River is a small stream, little more than a creek in the dry season; it flows from 1,524 metres (5,000 feet) elevation to the sea. The valley walls are V-shaped, the average slope being probably as high as 35° or even 40°. The country rock is a badly decomposed andesite, for the most part with some tuff deposits, much jointed and with innumerable small faults, all loosened by many earthquakes. Here we have ideal conditions of instability, which were perfectly apparent to geologists; yet, so far as the writer knows, no geologist was consulted by the engineers until it was too late. The inevitable happened. First, slides continued until the slopes reached the angle of repose; then dams followed, impounding the water to a great depth; next, the dams broke and search parties were out looking for the road, buried under twenty metres of débris. Now, after many years and the expenditure of much

money, a new road has been constructed by way of the old Naguilian trail. We have had to go back to the ridges, following the example of the Spaniards. Of course, if we had cared to, we might have taken a lesson from the native trails, the majority of which follow ridges.

In the matter of engineering technic involved in the construction of these roads, the writer would venture to lay emphasis on the necessity for drainage; keep the foundation of your road drained. The excellence and easy maintenance of the Hawaiian roads is due largely to the very porous subsoil and, consequently, perfect drainage. You may say that this is nothing new, that every engineer knows that; but the application of drainage in America, where the rainfall is merely a light summer shower as compared with the tropical downpour, is a different problem. As to how it should be drained, that is a matter not within the writer's province as a geologist.

Maintenance on a road constructed of poor materials is one thing, while that on a road wherein a wise selection of metal has been the rule is an entirely different thing. In this a geologist with his microscope is a necessity. Petrography, once looked upon as a mere academic study, is now indispensable to the scientific road builder. There is a pathology of rock just as there is a pathology of animal tissue. The microscope will reveal at once, and at little expense, whether or not the minerals composing the rock are sound, whether there is incipient decomposition, or a far-gone state of decay. It will show also the texture or fabric of the rock. If the rock has an ophitic texture, that is, the minerals interlaced to make up a sort of mat, then we may look for toughness. Why one rock splinters and another does not is at once made clear.

At one time the writer collected rock specimens from a number of places along one of the principal Philippine highways, and among the samples was one that yielded a briquet which when placed in the Page cementation machine did not break under two thousand blows, whereas an ordinary basalt briquet yielded at the twenty-second blow. A thin section of the fresh rock was made and examination showed that there was a small amount of secondary calcite in the rock, an alteration product of the lime-bearing silicates; it was this that furnished the excellent binding qualities. The rock was a diorite just beginning to decompose without having gone so far as to reveal this condition to the naked eye. This rock, with its holocrystalline texture and just the right amount of calcite, would make a most excellent road metal because it has two essential qualities, namely, toughness and high cementation quality. Of course, the objection of high cost will be raised at once; but no matter how the finances stand, there is never any excuse for putting worthless and unsuitable rock on a road. The proper



Chico River near Tinglayan, Kalinga Subprovince



Flooded District, Callo Horran, Manila, Sept 2, 1914



way is to let the geologist recommend one or more kinds of material, and then the engineer may consider which he can afford to use. Many state highway departments now follow this method, and formerly the engineers of the Philippine government always submitted their road and building materials to the bureau of science for the proper tests. Of late years this has not been done, and the results are beginning to appear.

Still another important factor to be considered in connection with the cementation quality of the road metal is that of the wind. During a typhoon, a storm which is much like the gulf hurricane, the velocity of the wind is as high as 165 kilometres (103 miles) an hour and the roads are swept literally by a natural cyclone blower and all loose material is removed as effectually as if a vacuum cleaner had gone over them. So we must consider not only the work of the deluge of rain but the combined effect of water and driving wind. Road maintenance from these and other causes is a very serious problem, in the Philippines at least, and any criticism of our highways should be tempered by a consideration of the difficulties we have to overcome.

Two chief sources of trouble in concrete mixtures in the Philippines are found; first, the fineness and generally poor quality of the sand, and second, lack of strength of the crushed rock. Both Reibling and King, of the bureau of science, have repeatedly called attention to these weaknesses in local concrete, as revealed by their long series of actual tests made on thousands of samples. The ultimate cause for this condition of things is found in the mineralogy and geology of the raw materials employed. Not only is the mineral composition of the sand commonly used here unsatisfactory, but also the extremely weathered condition of the materials is a matter of menace. Now it is agreed that the practical tests are of prime importance in the proving of such materials, but the examination of the sand and of thin sections of the rock is also of very great value. Such examination will reveal the cause for the failure; and, of course, this is really the most important thing of all, if we want to avoid future trouble of this kind.

The so-called "sand" oftenest used here is sand only by courtesy. The microscope reveals little or no quartz, the feldspar present is often in a far-gone condition of decay, and the predominant minerals are often dark-colored hornblendes, pyroxene, olivines, etc. To one accustomed to the clear, white, sharp Ottawa sand used in standard tests, the local sand appears more like dirt.

Reverting to the subject of landslides, a thorough acquaintance with tropical conditions will reveal at once the futility of attempting to control slides like those of the Culebra cut at Panama. Retaining walls, drainage, etc., are all makeshifts. The only practical and final solution of the problem is to increase the sliding until the walls are brought to the angle of repose where they will no longer slide. According to MacDonald, geologist of the canal commission, the most important types of slides were structural breaks and deformations and for this type of slide there was only one remedy that had utilitarian value under the conditions involved, and that was applied. It consisted in making the slopes less steep by removing material from their upper parts until the balanced pressure at the foot of the slope became less than the crushing or deforming strength of the rock. In other words, the slopes were brought down to the angle of repose.

This was recently well illustrated at Eugene, Oregon, where both the formation (weathered basalt) and the rainfall simulate tropical conditions. A hillside of this material, becoming saturated with rain water, started to slice off, slide, and flow under a large lumber mill at the bottom of the slope, bulging the latter upward, completely throwing it out of alignment and even threatening the structure. The simple expedient of sluicing at the foot of the slide solved the difficulty and the material of the hill was brought to such an angle that it no longer moved.

**Artesian Water.**—In view of the fact that a great many people have a hazy notion of what an artesian well is, the term is here defined. An artesian well is a type of well first bored, as far as we know, in Artois, France, and when the word artesian is correctly employed we mean a deep well from which water flows

above the mouth under more or less pressure. This pressure is due to the peculiar geological conditions obtaining in the locality. Ordinary, shallow, dug wells are not artesian.

The principles governing the concentration and movement of ground water are now well understood; but, at the risk of repetition, the writer will make a few general statements.

Although we do not see it, the sea of underground water is almost as extensive as, and in some ways more important than, the ocean. All the rocks, varying in degree of saturation, contain water down to limiting depth. Some of this water is found in the large trunk channels, joints, and faults, but a great deal of it is in the form of hygroscopic water; that is, water held in the pores of the rock by capillary attraction.

An English geologist, H. B. Woodward, makes the statement that the quantity of water held in the chalk of England by capillary attraction is tremendous. One square mile of dry upper chalk, one yard in thickness, contains ordinarily nearly 3,500,000 gallons of water, and when saturated holds 200,000,000 gallons. Recent experimental work by Van A. Mills\* indicates that, in saturated strata, capillarity retards fluid movements, so that water so held might not flow readily.

Some rocks, like the dense volcanic flows and quartzites, contain practically no water. Other rocks, like the limestone formations, have subterranean rivers passing through them, but the sandstones and chinks are the most important in this respect. A true sandstone consists of grains of quartz compacted together. The more nearly spherical these grains are, the more continuous are the openings, ignoring for the moment the cementing material which in some cases may completely close the voids. In such an arrangement of spherical grains there is always one continuous passage through the mass. Along these passages the water travels. Some sandstones have as high as 35 per cent. of pore space.

The loose volcanic tuff formations of the Philippines are also great water-carrying formations. This water is generally circulating slowly in the small openings, but when the water reaches a fissure, naturally the circulation is rapid.

As the deep-seated igneous rocks are usually dense and have but little pore space, and as the fractures in these rocks have no regularity, it can be seen at once that they are poor formations in which to seek water. Water may be traveling along a fissure in such formations, and the well digger may perchance strike this fissure, but usually the chances are slim. There is no excuse for locating a well in such a formation, unless this is the only kind of rock in the region. A limestone formation is also poor, as a rule; for, while it is cavernous and contains underground streams, it is a piece of pure luck when one of these is struck. Pratt,† a former colleague in the Philippine geological work, found that where coral limestone was interbedded with clay layers a fairly good supply of water was available. Very often, however, shallow wells in limestone areas located near the sea would yield salt water or be dry in about half the cases. The best conditions are found in the sandstone, volcanic tuffs and beds of unconsolidated ash.

Having found the formation, we must next consider some features in the structure of the region. The ideal condition is where the sediments form a syncline (basin), with the water-bearing stratum outcropping at a higher point than the site of the well and where there is an impervious layer of clay or shale just above the water-bearing stratum. The effect of a fault on the water circulation would be to divert the flow to springs at the outcrop, but the effect of an igneous intrusion would be to block the water circulation. All of these conditions must be considered, if possible, previous to the digging of the well.

It is incredible that even at this late day water should be sought with a divining rod, yet a few years ago an attempt was made to find artesian water with a divining rod in the city of Zamboanga, Mindanao. Water was not found, and an examination of the geology of the country showed that very little chance existed

\*Econ. Geol. 15 (1920) 420.

†Pratt, W.E., Philip. Journ. Sci. 10 § A (1915) 236.



of a supply being tapped within a reasonable depth in the location desired. In spite of some apparently successful instances of the use of the divining rod, the employment of this device may be classed with other pseudo-scientific operations, such as palmistry and astrology.

Probably the bureau of public works has paid more regard to the geology of the country than any other engineering organization in the Philippines; and, so far as its wells have been dug in the Manila central plain, good results have been obtained. But the writer wishes to emphasize this fact; that, in spite of all the practical experience of a well driller, there are many more things to be taken into consideration than simply those that pertain to digging the well.

Some years ago at Olongapo, Luzon, a well was drilled on the naval reservation; the writer, when visiting the place, examined the cuttings in the drill and found the material to be diorite, which is the basal formation of the island and contains very little water, having no regular continuous water-passages. The well digger drilled here for twenty-two months. No water was found, and in the end he lost all his tools in the hole. As the driller was paid by the foot, he, of course, did not have to pay the bill.

In parts of the Hawaiian Islands water has been found by sinking through the overlying formation, largely consisting of lava, to the ash beds that lie buried below. The water here is ponded in this loose formation by the coral reefs bordering many parts of the islands. The same conditions, no doubt, could be found in other tropical countries.

At the present time geologists are engaged in the Hawaiian Islands in attempting to locate high level sources of water to be brought down for irrigation purposes. Some success has been met with by bringing water through tunnels from the rainy sides of the various islands to the drier sides. It should be pointed out here that if the geologist is expected to predict the finding of water in such regions with any degree of certainty unfair advantage is being taken of him. The conditions in predominantly lava formations are too uncertain to permit of the more nearly exact work possible in the stratified rocks. The geologist can do many things, but he is not gifted with second sight.

*Dams and Reservoirs.*—The geological conditions affording the best sites for dams and reservoirs have also been discussed by several writers. With reference to this phase of the subject, the writer wishes to state that a geological examination of a district and several years of stream gauging are not only desirable but imperative in the tropics. Many examples of how these works should not be located could be cited, but two or three will suffice. The city reservoir at Montalban, Luzon, was located in a limestone gorge. The limestone is full of caverns and the reservoir failed to hold water until it was lined, bottom and sides, with cement. If the dam had been placed at the upper end of the gorge the reservoir would have had a natural clay bottom.

The destruction some years ago of the Tarlac (Luzon) dam probably could not have been foreseen, but if a few more data concerning annual precipitation and stream discharge had been secured the trouble might have been averted. Agno River when under full head is a terrible engine of destruction. Another dam was built in the hills back of Cebu, making use of an apparently substantial formation for abutments and spillway. Drilling was recommended by the geologist who examined it; but no, that would be too expensive. The abutments held in a terrific storm that ensued; but the spillway, which was too small, forced the water to eat its way down through a decomposed formation which had a hard shell on the outside, so that the dam was rendered useless. The writer, from his observations in the Philippines, should be inclined to say *never* when it can be avoided build a reservoir in the tropics. If water is needed, use diversion weirs in the streams or artesian wells.

*Coal Mining.*—The writer had not intended to touch on any phase of the application of geology to mining engineering in this article for the reason that the connection between the two is so generally recognized. There is one particular phenomenon that

has given more or less trouble to those who would work coal seams in the Far Eastern tropics. It has been the writer's experience throughout some years of examination of coal prospects and mines in the tropics that the persistence of a given seam of coal is always a matter of conjecture. The seams are either interrupted by small faults or they thin, or " peter out," just when you are counting on a good working thickness.

We have great rainfall over most of Malaysia to-day. There is every reason to suppose that this has been the case throughout most of the Tertiary period, which is the age of the tropical Malaysian coal. These great deluging downpours of rain mean coarse sedimentation and frequent interruptions to the quiet accumulation of vegetal matter from which we are to hope for a future coal deposit. We do find that the character of the underlying and overlying beds in the neighborhood of these uncertain coal beds is very variable; coarse and fine strata alternate with, in many places, no great thickness to any one stratum. So the advice to the engineer or geologist who is sent out to examine a coal deposit in any part of the tropics is this: Examine carefully the nature of the inclosing strata, the character of the grains, their size and arrangement, and take nothing for granted; put down test pits or drill holes fairly closely spaced and, better still, drive on the coal. The reader who would care for more detailed discussion of this topic will find an admirable paper on the subject by Pratt.\*

*Geodesy.*—Over fifty years ago there appeared in the transactions of the Royal Society† several articles by the Bishop of Calcutta, a mathematician and physicist of no mean repute, relating to the perplexities then confronting the surveyors in control of the great trigonometric survey of India. This, one of the greatest of surveys, has recently been completed. The problem that confronted them was how to account and allow for a very noticeable and very important discrepancy between the trigonometrically located stations and those ascertained by astronomical determinations.

It was expected that the great mass of the Himalayas would deflect the plumb bob toward them, but another factor entered into the problem which at first was not understood, namely, density. There was for some reason a deflection of less amount of the negative sign which could not be accounted for; it was finally accounted for by assuming a deficiency of gravity beneath the mountain mass and a greater gravity beneath the sunken area to the south. The whole question is intimately bound up with the theory of isostasy, which is too complex a subject for review in this paper.

In 1906 Hayford‡ wrote a paper, in which the whole question is reviewed and the theory of isostasy clearly substantiated.

In the course of the coast survey of the Philippine Islands, also, considerable discrepancies were frequently noted between the trigonometrical and the astronomical location of stations, in some places amounting to 30 or 40 seconds of arc; such a difference might mean a matter of one-fourth mile or more on the surface of the earth. How to adjust this has been a matter of some difficulty. The great piles of volcanic rock constituting the Zambales Mountains suffice to explain the discrepancies at some of the stations on the west coast of Luzon. Near Olongapo, it was found that the plumb bob was deflected to the west instead of to the east, though the main mass of the Zambales Mountains lies to the east. An examination made by the writer several years ago on the Cinco Picos Range, which lies to the west of Olongapo, revealed the fact that these mountains are made up of one of the densest rocks known, periodotite. This rock has a density of over 3, whereas the main mass of the rock in the Zambales Range to the east has a density of only about 2.5. Therefore, apparently, this discrepancy is explained by our knowledge of the geological features of the two regions.

The work of Hayford has shown so clearly the importance of the data of geodesy in the solution of problems of geophysics

\* Pratt, W. E., Philip. Journ. Sci. § A 10 (1915) 289.

† Phil. Trans. Roy. Soc. London (1853).

‡ Hayford, John T., Proc. Washington Acad. Sci. 8 (May, 1906) 25 40.



that geologists interested in these broader and fundamental problems, such as that of isostasy, cannot afford to ignore them. On the other hand, from the example cited, the dependence is clearly seen to be mutual. The writer is planning to carry a small gravity instrument into the interior of Luzon on some of his expeditions within the coming year, as we have no data of this kind from the interior.

*Physiographic Influence upon Economic Development.*—Under this topic it is proposed to cite several examples of how a knowledge of the geologic and physiographic conditions would be of direct practical value in other matters, aside from its more obvious applications to mining, and so forth, already given. The relation to engineering here is only indirect.

Although Magellan discovered the Philippine archipelago by first landing at Cebu and although a large and prosperous city is there to-day, the physiographic advantages of the position of Manila are so superior that it has been able far to outstrip its southern rival, notwithstanding the fact that Manila as a Spanish city was not founded till nearly a half century later. Cebu is a distributing point and has to draw upon neighboring islands. In Manila we have a remarkable juxtaposition of sea, excellent harbor, river, mountain and plain (affording a productive hinterland) which has led to the development here of what is fast becoming the most important city of the Orient.

*Seismology.*—Earthquakes are not confined to the tropics. Nevertheless, many regions of great seismic disturbances are either within the tropics or not many degrees removed. There may or may not be any direct connection between these facts. It also happens that many of the geologically newer parts of the earth are within this zone. In view of the great engineering works built at Panama, in the Hawaiian Islands, in the Philippines, and elsewhere it is of prime importance to understand the principles controlling earthquake phenomena. The damage done at San Francisco by the slip along the San Andreas rift, the catastrophes of Messina and Avazzano, and the lesser disturbances that have occurred in the Philippines from time to time should force us to pull our heads out of the sand and look facts squarely in the face. Real estate boosters as a rule do not readily fall in with this idea.

For the benefit of the possible play reader a few elementary facts are here repeated. Earthquakes are due to three causes; namely, rockfall, vulcanism, and slips along fault planes. These are called tectonic. Those of the last group are most numerous and most destructive. The San Francisco earthquake of 1906 was of this class.

In an investigation conducted for many years by Father Saderra Maso, of the Philippine weather bureau, and the writer, we found that of the great number of earthquakes that occurred in the Philippines from 1599 to 1909 only a comparatively small number could be traced to volcanoes; that of the twenty-five seismic districts in the islands only five are near or include active or dormant volcanoes; and that two regions of greatest seismicity have no volcanoes at all.

Recently some very interesting and important conclusions concerning the connection between seismic phenomena and rainfall have been put forward by M. G. Zeil, \* formerly topographer and geologist of the government of French Indo-China and now of the Carte Geologique of France. This investigator asserts that seismicity in various parts of the world increases with rainfall. He mentions only one notable exception, the Valley of the Amazon, where, although the rainfall is heavy, seismicity is feeble. He cites, especially, the example of Agusan Valley in the Philippines to which Saderra Maso and the writer called attention some years ago, though not connecting the fact with the rainfall of the region.

It appears that the rapid loading and unloading of a given piece of terrain by a heavy rainfall which is discharged quickly into the lowlands or the sea, effecting considerable erosion, is the prime factor in many of the sudden adjustments in the outer shell

of the lithosphere. In a heavily forested region like the Amazon the run-off of the streams is slow and consequently erosion is comparatively slight.

The rainfall would have still another effect, that of lubrication, thus causing slipping of one formation, or of the beds of the same formation, over one another.

M. Zeil in a letter to the writer has pointed out that in Annam, in those places where the natives have cut away the forests, the number and frequency of earthquakes have increased. Here is a splendid example of the need for co-operative investigations on the part of the engineer, the forester, the seismologist and the geologist.

This particular subject is one to which we have as yet devoted little attention in the Philippines, but we shall in the future attempt to follow up these most interesting suggestions of M. Zeil.

There are three things we must do in order to cope with earthquakes. The most obvious thing is in the line of engineering. We must build structures so tied together that the parts will not fly into fragments, and the material must be elastic. The safest and cheapest type of construction is the native house of bamboo wherein rattan takes the place of nails. Sand-lime brick securely tied to a steel frame, and re-inforced concrete, are the most suitable for large buildings. Volcanic tuff (locally quarried as Guadalupe stone) is one of the best cheap materials I have yet seen. The walls and many of the older public buildings of Manila are constructed of this stone.

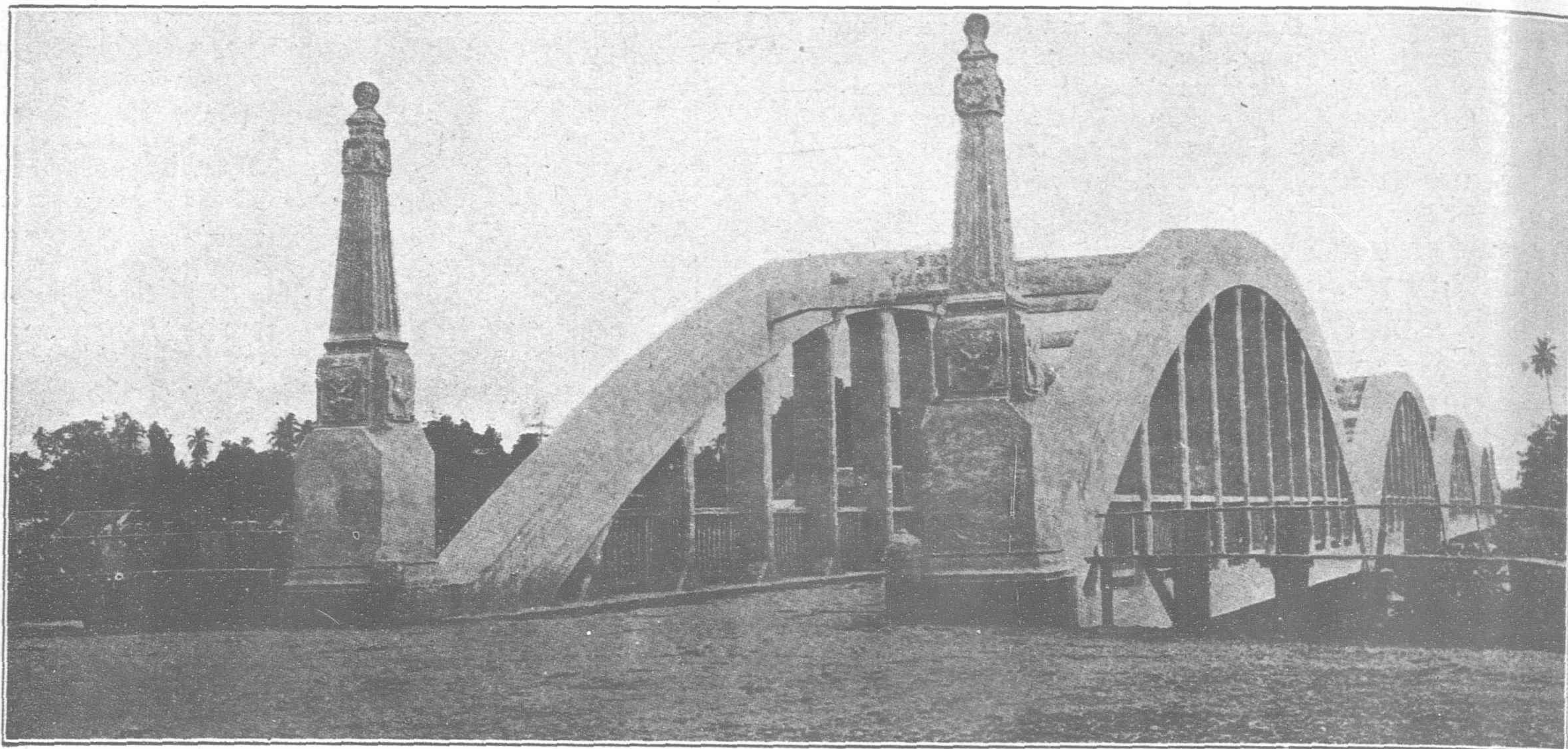
Finally, as volcanic eruptions and tectonic earthquakes may both be connected with deep-seated phenomena in the earth magma, it behooves us to proceed vigorously and continuously with detailed volcanological studies along the lines laid down by Perrett, of the Vesuvius Observatory; Omori, of Japan; and Jagger, of the Volcano Observatory of Kilauea, Hawaii. If we do this we shall have a collection of data which in time will enable us to cope with these dreaded phenomena as we now do with the typhoon.

### Summary

1. The geological agents at work in tropical regions are the same as those found operating in temperate parts of the earth, with the difference that they are often greatly accelerated in the former.
2. In the Philippines structural conditions are of prime importance in engineering. Both major and minor faulting occur here which as yet have not caused trouble save in mining operations.
3. Both road location and maintenance in tropical countries like the Philippines are much more difficult than in the United States and Europe.
4. Dams and reservoirs should be avoided when possible in countries like the Philippines.
5. The instability of the Philippine geological structure is established.
6. Weathering of the rocks in tropical regions is notable. The so-called laterite, in some places of considerable economic importance, is a product of weathering. It is characteristic of many tropical countries.
7. The geologic work of organisms is great in the tropics, though but little studied.
8. The work of tropical rain and running water is not appreciated as it should be.
9. Handbooks and formulæ prepared by engineers acquainted only with conditions in temperate regions are worse than useless in the tropics. They are positively dangerous.
10. Engineers as a whole should, if possible, give more attention to the study of modern geology which is no longer merely a descriptive subject but is becoming more and more a close relative of engineering.

\* Zeil, M. G., Acad. des Sci., Seance de 12 juillet (1920) 117-119.





The Rasada Bridge at Lampang on the Northern State Highway, No. 10 of Siam. Built of Reinforced Concrete, 4 Spans of 32m. Total length 130m.

## Siam's National Highways

JAPAN is famous for its Tokkaido and other medieval highways along which blazed the pomp of a feudal past, serving as the main artery of trade and travel in the days before the railway began its task of modernizing the country, Japan, it may be said, is just awakening to the need of better transportation facilities. Millions are now being freely appropriated for new roads. As we pass over into Korea we find that whatever backwardness is seen in Japan proper, is fully made up by the remarkably fine system of highways which reach into every corner of this dependency. A few years ago China had no roads outside the immediate environs of the large treaty ports. The famine of last year, however, gave a great impetus to new construction and from all sections of the vast country we now hear of new roads, autobus scheme and other signs betokening a healthy interest in transportation problems.

It is only as we go further south in Eastern Asia that we find road-making forming part of a fixed government policy with definite programs and budgets. Americans in the Philippines set the pace and covered the islands with a system of highways, the admiration of tourists and visitors from all parts of the world. Several years, however, of Filipino autonomy under which the roads have been permitted to deteriorate, has provided the opportunity for other sections of south-eastern Asia to forge ahead and surpass the Philippines in the quality of their highways. Especially is this so in Hongkong and Kowloon, where the roads, although of limited mileage, are unrivalled by any other part of eastern Asia. The highways of the Federated Malay States are now considered as the best, with Java as a close second.

The kingdom of Siam is coming to the front with a national road building program. In 1918 a royal decree authorized the abolition of the old road commission and handed over its work to the ministry of communications. A department of ways was created under the direction of Phya Sarasastra Sirilakshana, who, as chief highway engineer, organized a staff and force of 1,735 the first year, in which only four Europeans were employed. The last year, 1920, saw this force increased to 2,136, composed of Siamese, 1,802; Europeans, 4; Chinese, 199; Indians and Malays,

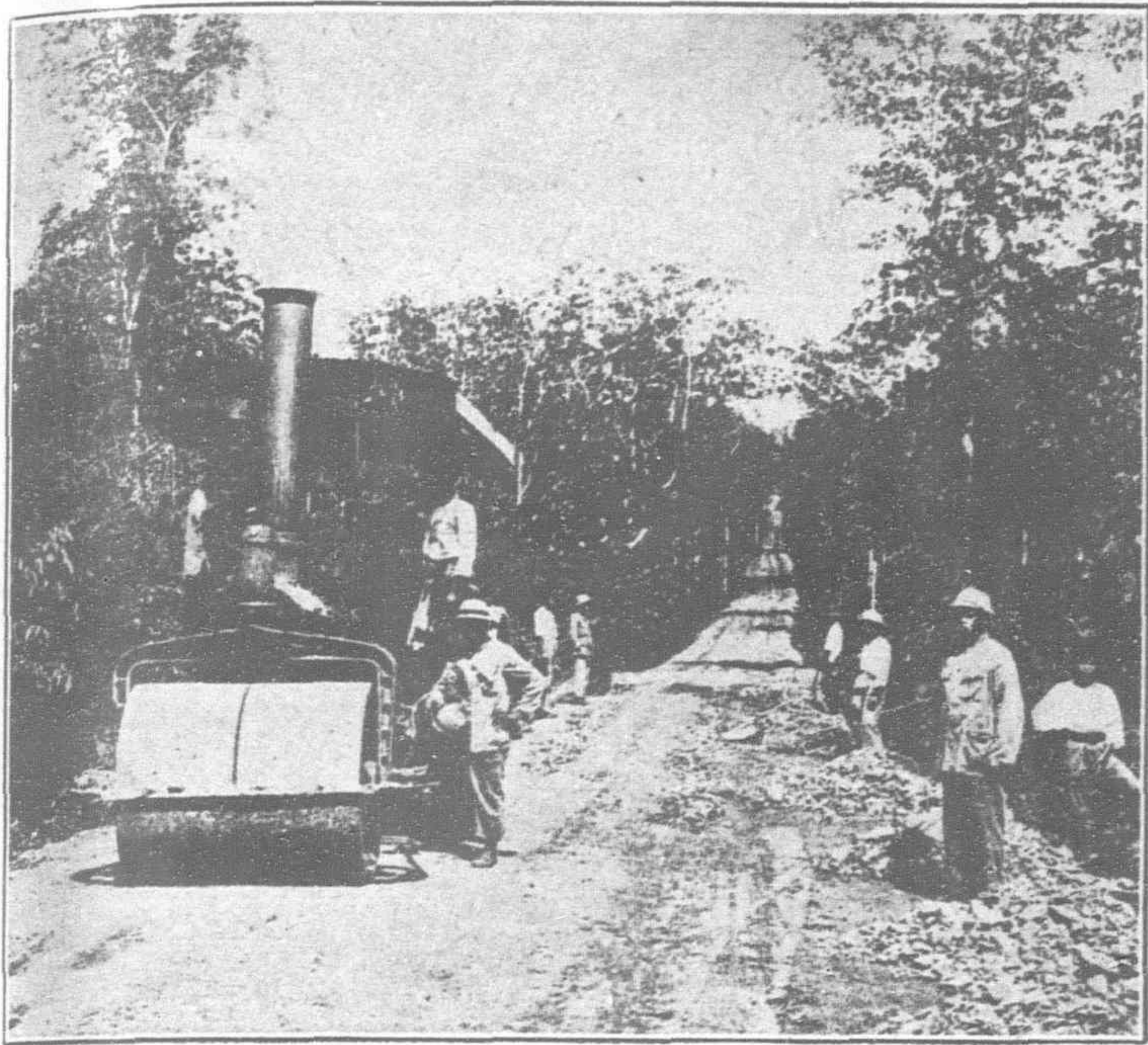
130. The Chinese are employed mostly in earthwork and erection of bridges.

The new department commenced its work by devising a national system of highways to be controlled by the central government, and for this purpose took over such provincial and other roads deemed most important as trade routes. In this manner a nucleus of a good national system was found, whose future improvement, maintenance and extension would come under the direct charge of the government. For the selection of other state highways investigations are being carried out, and it is hoped that with a fuller knowledge of trade and traffic requirements, checked by actual traffic statistics, the new administration, in course of time, will be able to determine the best and most important routes to be incorporated into the state system, and also to select the most suitable centres of communication from which to radiate networks of subsidiary roads. It is expected that constant reclassification of roads must be made during the first few years, and that a settled program cannot be arrived at until full and exhaustive studies of various conditions and possibilities have been carried out. In other words, Siam is going ahead with her road building along lines that is hoped will make for economy and efficiency. In order to secure uniformity of work, an instruction manual was issued for the use of the staff.

For the purpose of administration, the new department has been subdivided into three divisions: (1) Northern Highway Division, with headquarters at Nakon Lampang; (2) Central Division, with headquarters at Bangkok; (3) the Southern Division, centred at Singora. These divisions are again divided into sub-divisions, and districts according to the number and importance of the highways under their charge. The main object of the new department in creating the new highway system is ultimately to reduce the cost of transport per ton kilometre, thus encouraging the commerce of the country which cannot be handled by railway or river.

To arrive at a proper appreciation of the transportation needs of the country a most comprehensive record is being compiled of the traffic over the various roads in the country. Observations are being constantly made and a traffic census compiled, with special





Road Making in Siam. The Denwaya-Prae Road, of the Northern State Highway Division

reference to the staples of the country requiring transportation for export.

The total length of the Siam State Highways for 1920 is given in the following table :

Division	Under Maintenance				Under Improvement				Under Construction				Total per Class				Total Kms.
	I	II	III	C.T.	B.P.	I	II	III	C.T.	B.P.	I	II	III	C.T.	B.P.		
Northern	4	—	—	—	—	53	49	34	—	—	240	—	—	—	—	57	380
Central	—	—	—	—	—	—	—	1936	—	—	49	112	—	—	—	49	2097
Southern	—	—	—	—	—	83	43	230	400	—	170	164	—	—	83	43	1090
Total	4	—	—	—	—	83	96	279	2370	—	459	276	—	—	83	100	3567
B.E. 2462	—	—	—	—	—	84	89	669	1972	—	674	112	—	—	84	89	3600

Note:— I. = First Class Road  
II. = Second Class Road  
III. = Third Class Road  
C. T. = Cart Track  
B. P. = Bridle Path

For the first year of its operation, the department expended Ticals 832,784. This was increased to Ticals 1,213,972 for the year ending March 31, 1920. Of this sum, Ticals 359,223 was devoted to construction, Ticals 577,133 to improvements, while Ticals 200,279 went to maintenance. The total amount expended by the new administration for the two years ending March 1920 amounted to Ticals 2,045,856. Considerable plant and equipment and various road-making machines have been purchased from abroad, the expenditures for these items for the year ending March 1920, being Ticals 65,793 in comparison with Ticals 13,923 the previous year. In fact, the work of the new department has been consider-

ably handicapped the first two years by the lack of this equipment, and is now endeavoring to enlarge its capacity for further and better work by the purchase of new plant and road machinery.

The highway authorities in Siam are having the same difficulty with the upkeep of the new roads as the Americans originally had in the Philippines, where the old native carts with their narrow knife-like types cut the road to such an extent that a law had to be passed regulating the width of the tyre. The same troubles are being encountered in Siam, where, after a nice new stretch of highway is completed in certain districts, it has been quickly damaged by the heavy timber transportation on these narrow tyred vehicles. Local authorities have received instructions from the government to forbid such traffic and regulations are to be placed in force limiting the size of tyres.

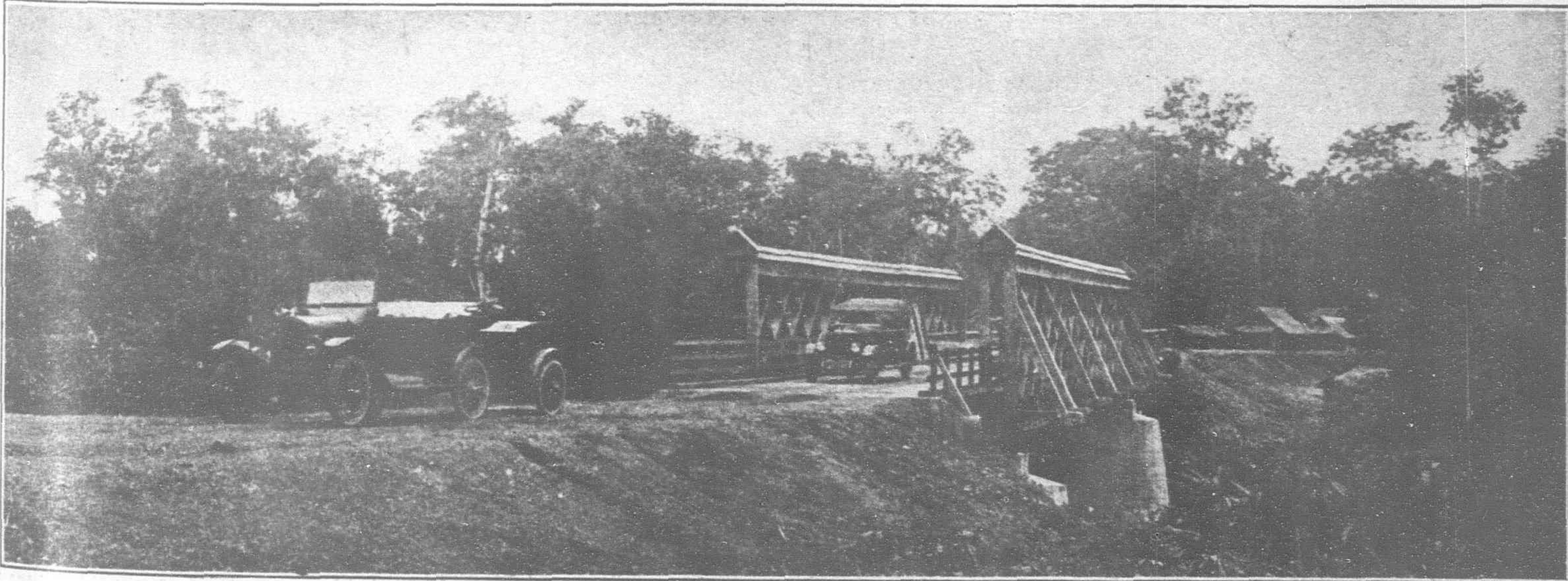
List of Highways

NORTHERN DIVISION

No.	Between	Length of Highway under			Total length	Class
		Maint.	Improve.	Const.		
1	Den Jaya—Phrae ...	—	25	—	25	II
2	Lampun—Chiengmai ...	—	28	—	28	II
3	Lampang—Chiengrai ...	—	—	240	240	III
4	Chiengmai—Mae Rim ...	—	15	—	15	C.T.
5	Chiengmai—Sankambaeng ...	—	13	—	13	III
6	Chiengmai—Doi Saket ...	—	19	—	19	C.T.
7	Chiengmai—Mae Tachang ...	—	14	—	14	III
9	Station—Lampang ...	4	—	—	4	II
10	Utaradit—Phra Taen—Laplae ...	—	22	—	22	III
Total ...		4	136	240	380	

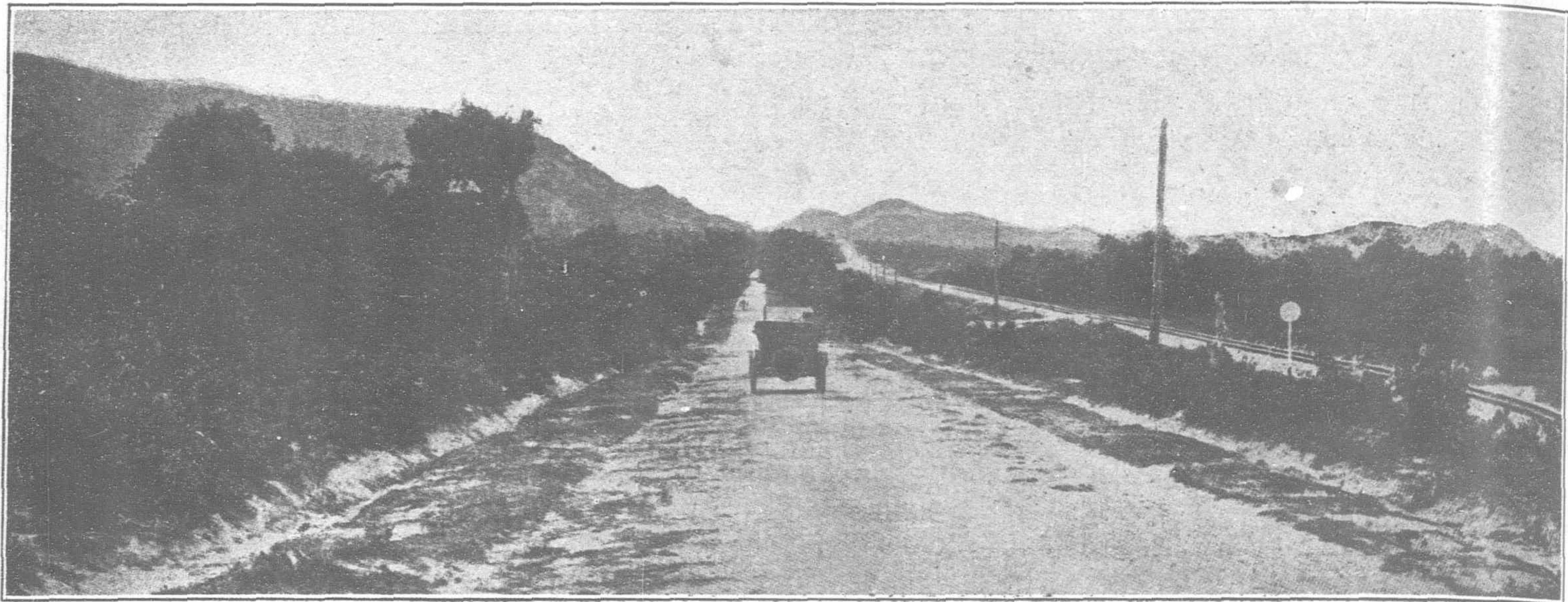
CENTRAL DIVISION

No.	Between	Length of Highway under			Total length	Class
		Maint.	Improve.	Const.		
1	Bang Mong Nak—Petchabun ...	—	—	112	112	C.T.
2	Pak Prec—Hnong Kae... ..	—	22	—	22	C.T.
3	Chandhaburi—Tha Cahlaeb ...	—	—	14	14	III
4	Trad—Landing ... ..	—	—	—	—	—
5	Korat—Prachin... ..	—	371	—	371	C.T.
6	Korat—Skol Nakorn ... ..	—	405	—	405	C.T.
7	Ban Tum—Ubol ... ..	—	353	—	353	C.T.
8	Ubol—Roi Etch... ..	—	172	—	172	C.T.
9	Udara—Skol Nakorn ... ..	—	162	—	162	C.T.
10	Korat—Hnong Kai ... ..	—	391	—	391	C.T.
11	Pimul—Chong Mek Pass ...	—	—	35	35	III
12	Nang Rong—Buriram ... ..	—	60	—	60	C.T.
Total ...		—	1,936	161	2,097	



Mae Moh Thasi Bridge K. M. 35. Northern State Highway No. 3

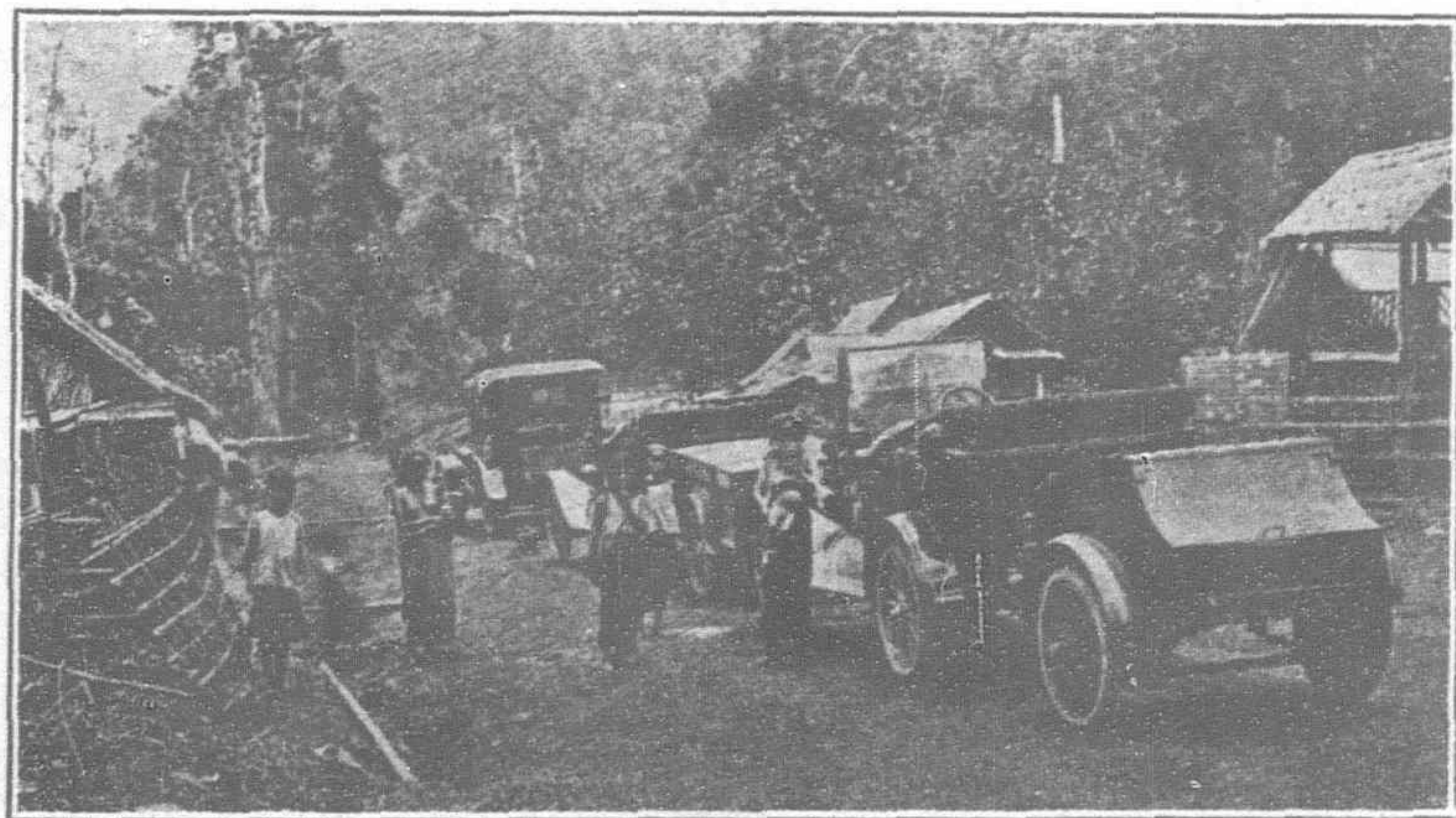




Road and Rail in South Siam

SOUTHERN DIVISION						
No.	Between	Length of Highway			Total length	Class
		Maint.	Improve.	Const.		
1	Chumphon—Tap Lee ...	...	—	51	51	III
2	Thanun—Tai Muang ...	...	24	—	24	III
3	Kok Kloi—Kalai ...	...	17	—	17	III
4	Setul—Hnong Chin ...	...	40	46	86	III
5	Tongkha—Laem Kuan...	...	35	—	35	II
6	Tongkha—Sala Ketho ...	...	15	—	15	III
7	Tongkha—Ban Ra-Ngaeng ...	...	22	—	22	III
8	Ban Tha Rua—Ban Bang Tao...	...	8	—	8	II
9	Kan Tang—Patalung ...	...	96	—	96	III
10	Trang—Nakorn (Ta Bae) ...	...	136	—	136	C.T.
11	Songkhla—Sadao ...	...	83	—	83	I
12	Ban Ko Hongse—Haad Yai ...	...	—	5	5	III
13	Raman—Kabu ...	...	10	—	10	C.T.
14	Patani—Yala ...	...	46	—	46	C.T.
15	Patani—Raman...	...	75	—	75	C.T.
16	Patani—Tanjong Mas ...	...	122	—	122	C.T.
17	Yala—Yaha ...	...	11	—	11	C.T.
18	Ban Pong—Kanchanaburi ...	...	—	56	56	III
20	Sadao—Padang Besar ...	...	—	12	12	III
21	Yala—Betong ...	...	—	118	118	C.T.
22	Nakorn—Ronglek (Nobpitam)...	...	—	46	46	C.T.
	Roads in Renong ...	...	16	—	16	III
Total ...		—	756	334	1,090	

Some of these roads will have a great bearing on the opening up of Siam, the transportation of her products to outside markets, and closer intimacy with her two neighbors, Indo-China and the Malay States. In the Northern Division, Highway No. 3, between



A Halt at Sala Cham Puey K. M. 46. Northern State Highway No. 3

Lampang and Chiengrai, 240 kilometres in length, when completed, will be one of the most important trade routes in the north. It passes through Muang Ngao, an important teak trade centre, and other well populated and fertile districts, and will open up the rich plains of Chiengrai, and bring the town of Chiengrai within one day's motor car journey from Lampang.

The greater portion of the roads in Central Highway Division runs through the eastern and north-eastern parts of the kingdom. Owing to the peculiar sandy soil and the severe floods arising from the Mekong and its tributaries, coupled with the fact that the traffic is largely composed of bullock carts with sharp wheels, render the problem of designing a suitable system of highways in these regions peculiarly difficult, and most careful studies are being made before any great expenditure is authorized. The most important undertaking in this division is Highway No. 6 from Korat to Sakol Nokorn, a distance of 405 kilometres. This highway leaves Korat by Pratu Phi and along the old Pimai road via Tha Chang to Buddhaya Song, Roi Ed and Sakol Nakorn. The importance of this road is seen in the 1919 traffic census. No less than 121,480 carts passed a given point during 1919, carrying roughly 26,000 tons of merchandise. Besides being the main highway between Nagara Rajasima and Prachin, this road is also an important link connecting the Korat plateau and the country round the inland sea of Cambodia, the most important trade route between the eastern plain of Siam and western Cambodia. In the dry season the amount of traffic passing through Chong Tako Pass averages 100 over carts per day. These carts go down into Cambodia loaded with general merchandise and come back to Siam loaded with salt and dried fish, the product of Talesap, the inland sea of Cambodia. Although the importance of this old trade route will be considerably diminished when the eastern line of the state railways is completed, enough traffic will remain to influence the department of ways to keep it in a state of good repair.

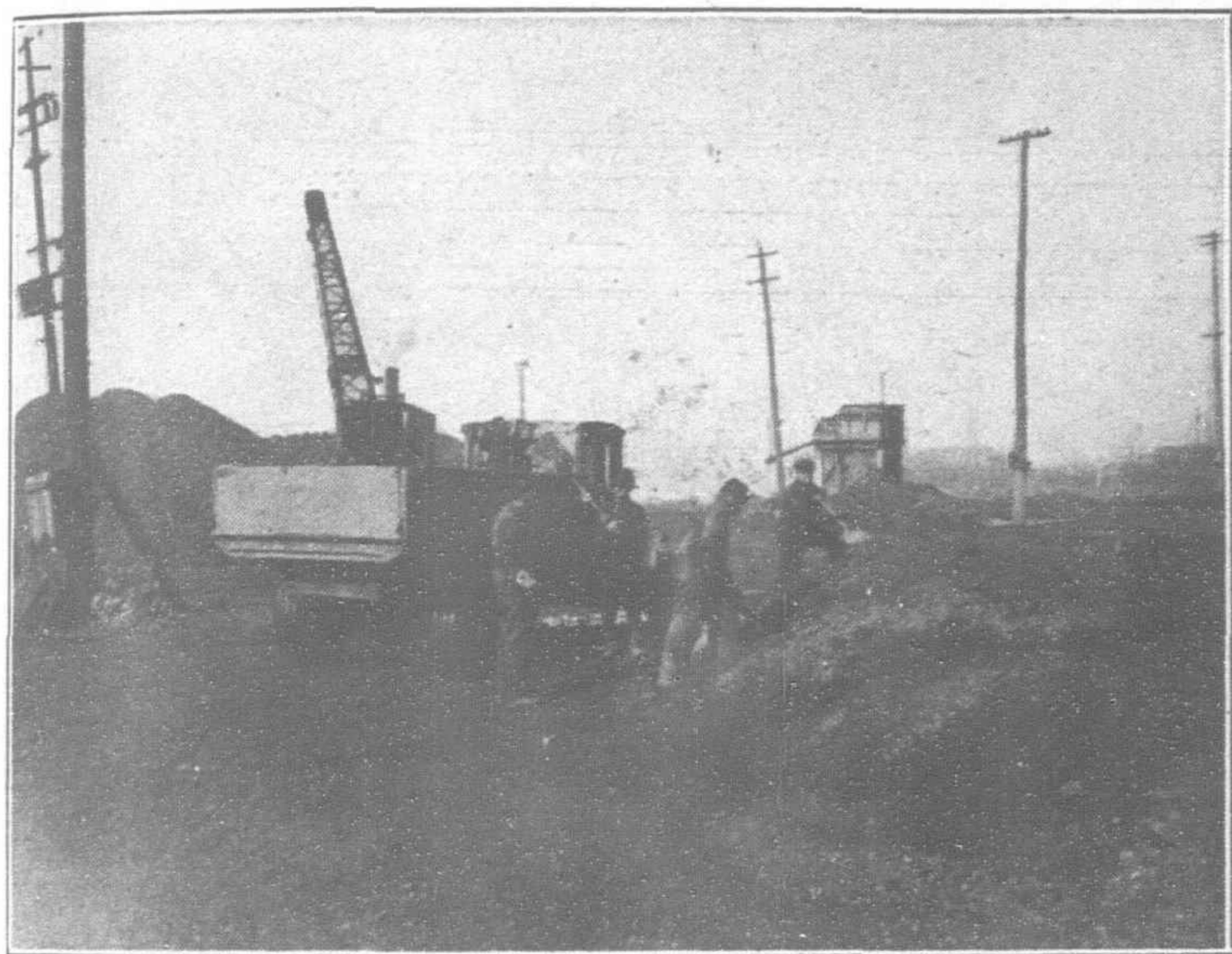
The roads in the Southern Highway Division are quite as important as those in the north opening not only rich mineral districts but linking up on the south with the highways of the Federated Malay States. The visitor to Siam coming from the direction of the Red Sea can now leave the steamer at Penang and take the F.M.S. railway through Alor Star to Ootapao junction and thence by the southern Siamese line to Bangkok, and then on by motor or rail to the Cambodian frontier, through the district to Saigon. In due time the Indo-China railways will be connected, permitting through communication with Haiphong and the Chinese border. The principal highway connecting Siam and the Federated Malay States is between Singora and Sadao, a first-class road, 84 kilometres in length. It has, however, lost much of its importance since the opening of the railway through Padang Besar to Panang and Singapore. Many of the roads in the southern division are being constructed for the purpose of opening up new mining districts.



# New Radial Type Loader for the Rapid and Economical Loading of Loose Materials

**I**N recent years the increasing use of sand, gravel, crushed stone, ashes, slag, etc., for road building, concrete work, and other purposes as well as the increased storage of coal and coke has caused the handling and rehandling of immense quantities of loose materials.

During the time that help was plentiful and cheap the prevailing method was to use a gang of laborers to shovel material from ground storage to wagons or trucks. However, the constantly increasing cost and acute shortage of labor demanded the substitution of mechanical handling machinery to replace the expensive and laborious "hand shovel" method as depicted by figure .11495.



The Old Way

To meet this demand the Jeffrey self-propelling loader manufactured by the Jeffrey Manufacturing Company of Columbus, Ohio, was brought out about 10 years ago after extensive experiments and tests and careful study of the then existing conditions, being the first machine of its kind to be placed on the market, and has proved a remarkable labor saver and quick handler of materials.

It has been used with great success by hundreds of leading concerns but in order to meet developments in the various industries and the constantly changing conditions the Jeffrey Company have developed an improved design known as the radial loader which overcomes all the objections of the old type of machine and is the last word in design and constructions.

This new type of loader is made in two sizes to suit capacity requirements and service conditions. The type "K" has a capacity of 1 cubic yard per minute while the type "G" has capacity of 1½ to 2 cubic yards per minute.

## Self-Feeding into Pile

The buckets of the elevator are wider than the elastic boom. This feature combined and that of the three wheel chassis allows the machine to advance into the material under its own power 8 to 10-ft., without any cleaning up whatever.

There is a great advantage in having the loader feed itself into the pile over other methods of hand shovelling or of using the special mechanical device to pull the material in front of the buckets.

The greatest objection to the old four-wheel type of loader was its inability to feed into the pile. The radial type loader digs itself into a pile of material—each bucket being completely filled.

## Three-Wheel Construction

The three-wheel construction of the Jeffrey radial loader enables it to move backward and forward along straight lines into pile of material.

By turning the steering wheel at quite an acute angle to the driving wheels the discharge chute will remain practically stationary



The New Way

as to the centre of the circle while the pick up end of the extended elevator boom will travel in a circular path. If the steering wheel is gradually turned through a few degrees either way from the above circular path the whole machine while cutting from right to left in an arc will gradually move forward into the pile allowing full range of the machine.

## Other Advantages of the Radial Loader

The radial loaders are built in two sizes known as type "K" and type "G." The buckets used on both type are designed for heavy service. The type "G" has 18" x 12" and type "K" 14" x 10" heavy malleable iron buckets with renewable digger edge, steel teeth, riveted on front lips and ends to protect them from wear.

## Two Speed Features

Experiments have shown that a two speed machine is absolutely essential to obtain the greatest results with the least labor. The Type "K" radial loader has a fast speed of 60 feet per minute for traveling from pile to pile and a slow speed of 4 feet per minute for feeding into the material. The Type "G" loader has a fast speed of 40 feet per minute for traveling from pile to pile and a slow speed of 2 feet per minute for feeding into the material.



# The Dairen Waterworks

## The Present and Future of a Model Establishment

By Dr. Y. Kuratsuka

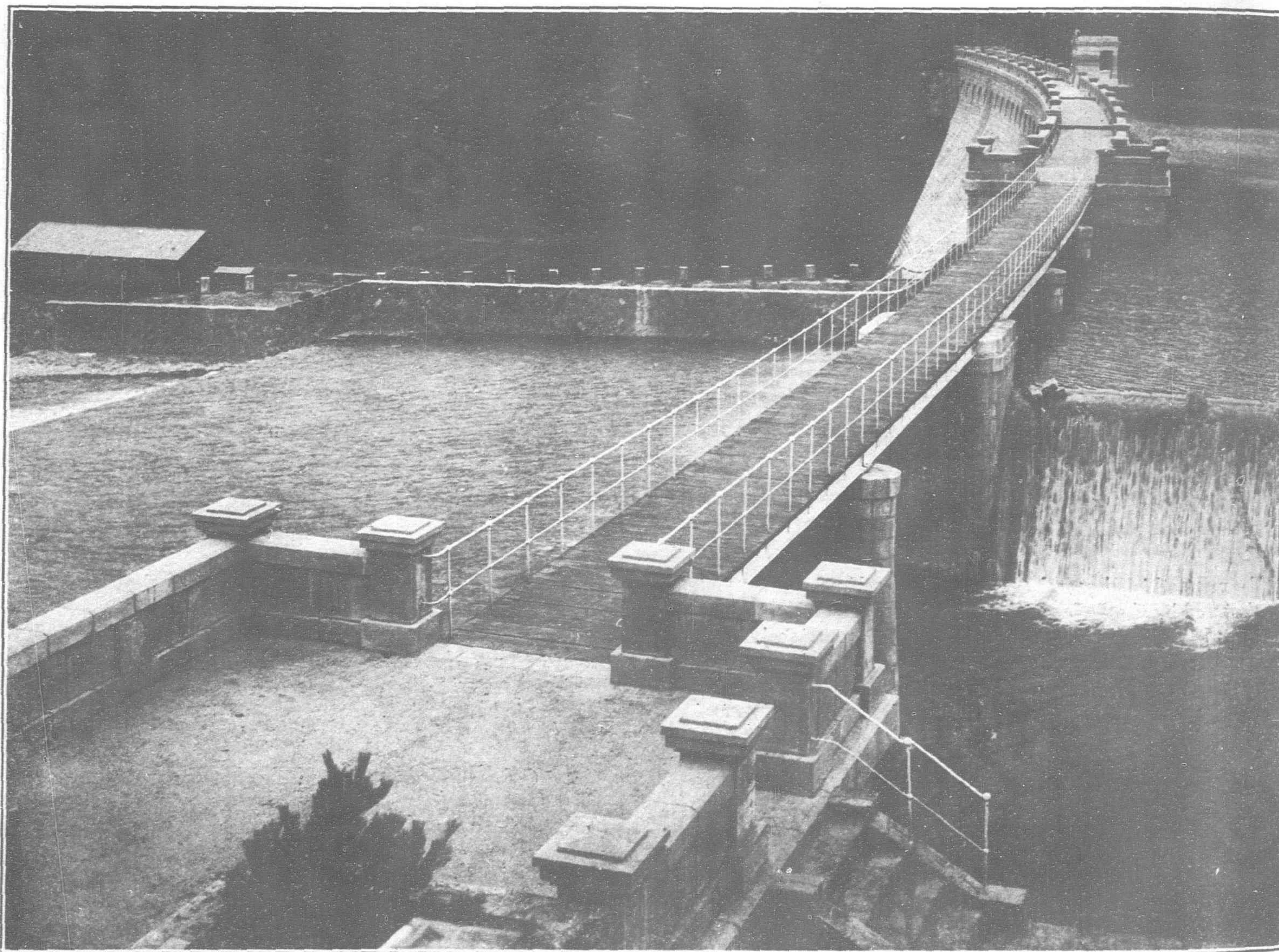
### I. Introduction

THE most important feature of a waterworks is the installation at the water source. The water source varies according to the geological, geographical and also meteorological conditions. But it may be classified into (1) drawing upon a river or a lake, (2) dependence upon a spring or natural fountain, (3) damming of rain water in a reservoir constructed for the purpose, and (4) drawing of a subterranean water at a great depth by means of wells, hundreds or sometimes thousands of feet deep. These may, however, be

most essential things to be done are to make a comparative, comprehensive study of rainfall, temperature, evaporation, velocity of wind, etc., together with the topographical and geological conditions of the particular locality, for which the waterworks is intended, and to draw a scientific and rational conclusion from the premises at command.

We will now take up Dairen.

The annual rainfall at Dairen amounts to only about 600 millimetres, being not more than two-fifths of the mean annual rainfall for Tokyo, which is 1,500 millimetres. The Dairen figure even ranks below that for Hokkaido, the driest district in Japan.



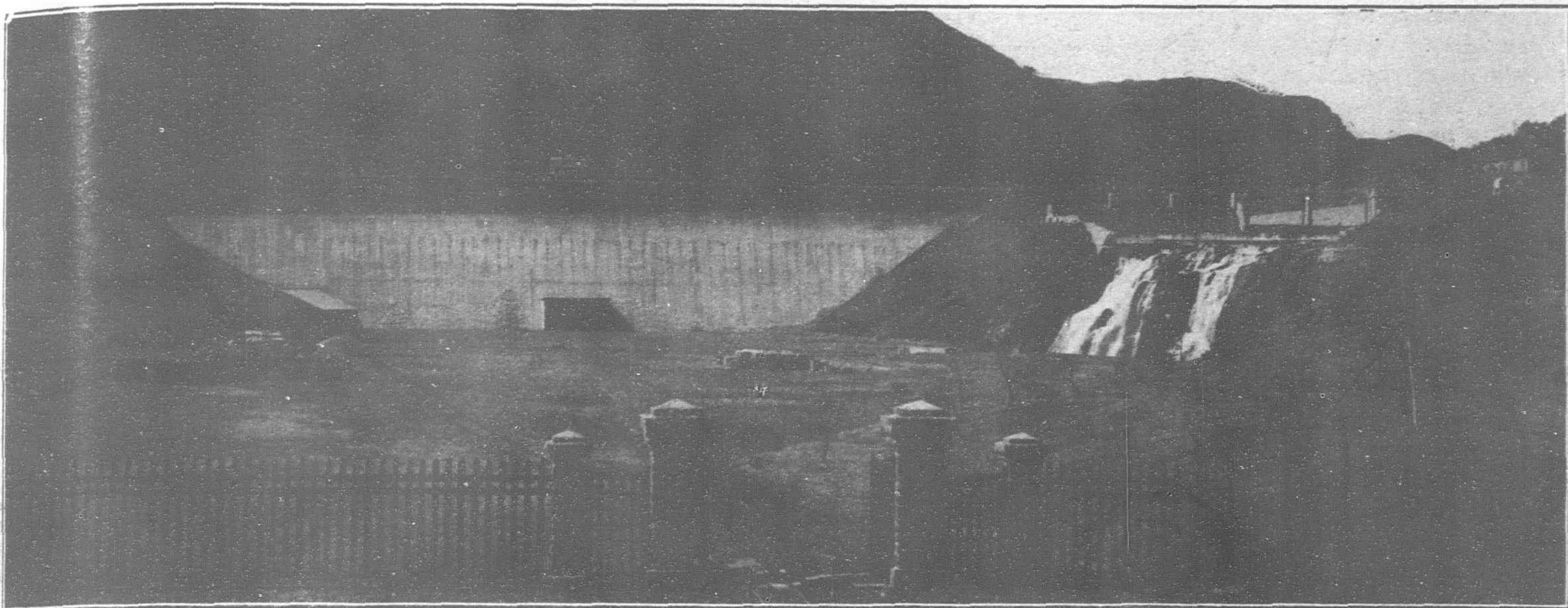
Looking down upon the Embankment of the Dairen Waterworks Reservoir at Wangchartien

disposed under the two general heads of a surface water source and a subterranean water source.

Still, in whatever case, for the water at a water source, rain water must be depended upon. Rain is, indeed, given man to serve as the primary source of water supply, for one. For this reason, the amount of rainfall is a most important factor to be considered in designing a waterworks of a city. For the authorities entrusted with the design and construction of a waterworks, the

The annual average rainfall is 638.13 millimetres. The heaviest rainfalls are experienced during the three months of July, August and September, followed by May and June. In any of the other months, the rainfall is usually very light. In other words, the rainy season runs from about the middle of June to the latter part of August, and the dry season from November to the ensuing March. In particular, February has the lightest snowfall and during this month the dry cold characteristic of Manchuria reigns.





General View of the Dairen Waterworks at Wangchartien, showing the Preservation of Natural Beauty in the Shape of a Waterfall

Thus, the total annual rainfall amounting to only about 600 millimetres, the rivers and brooks have only a nominal amount of water running throughout the year, except in times of freshets which occur at irregular, but distant intervals. It may be added that the flood is only short-lived in most cases.

Although the rainfall is small, the factors for causing loss to the water available are many and active. Over and above, Dairen is located at the extremity of a small peninsula, and although there are undulating hills, the region is wanting in broad glens and large rivers. Besides, the rocky structure predominates in its geological formation, and wooded area is preciously small. This feature deprives the locality of the capacity to store the rainwater. At a heavy rain, the rivers will be readily swollen all at once, but will relapse into the shrunk-up condition in a few days' time.

Geologically speaking, the Kwantung Leased Territory belongs to the Palaeozoic group chiefly composed of gneiss and rocks of pre-Cambrian system, which latter consists principally of layers of various kinds of quartzite, quartzite-slate and clay-slate, etc., overlapping one another, being characterized with the predominance of hard and dense quartzite. Granite rocks traced to the pre-Cambrian Period are found scattered about. There is the least probability of the existence of any water-bearing strata as the source of water for artesian wells. Altogether, the district is a hopeless country for striking a subterranean water vein.

From December, 1912, to July, 1913, a boring was executed at Hsiaokangtzu (Chinese quarter of Dairen) with Calix rotary core drills, to test whether water can be obtained or not by deep well. It was drilled to the depth of 585-ft. The pains taken was rewarded only by the penetration of the layers of diolite, quartzite, limestone, slate, etc., but nothing like a water bearing stratum. This attests to the hopelessness of obtaining an underground water vein about Dairen.

From the above, the only inference deducible is that, for the extension of the waterworks, which forms a problem of life and death to the growth of the city of Dairen, the surface water, meagre as it may be, must be relied upon. And, unlike other cities in Japan and elsewhere, where natural sources such as rivers, lakes, etc., are available, what may be styled the reservoir system is the only practicable way open. Even in the event of the adoption of the reservoir system, the supply capacity will prove comparatively low for the extensive scale on which the reservoir has been built, in view of the moderate rainfall and the active operation of the loss-factors such as evaporation, etc. Moreover, the topographical conditions of the district are such that no catchment basin of a large area can be found. Thus, the capacity of a reservoir must have a limit placed thereon. In consequence, in planning the extension of the existing waterworks in order to meet the rising need of the city of Dairen, it must be admitted to be absolutely impossible to

make an ample provision for the generations to come. Such is one of the limitations, from which we can never escape.

In other words, in case of the city of Dairen continuing to expand at the pace kept thereby hitherto, constant effort will have to be used to maintain the waterworks, for one, in an adequate condition.

This point was appreciated by the Kwantung government, and an appropriation amounting to Y.1,819,000 was set aside in order to extend the waterworks and to complete the water source of the Ma'an river as an enterprise extending from 1914 to 1919. This is what is referred to as the second extension program. Still, there can be no depending on the available supply, granting that the population of the city of Dairen keeps growing. Therefore, as a continuation work from 1920 to 1924, the construction of a new reservoir at Lungwangtang is now in progress, at the total estimated cost of Y.4,680,000. This may be called the third extension program. That further extensions will have to be executed in the future will be readily understood. Up to the second extension program (as matters stand at present), the construction work presented no engineering difficulty to speak of, and the requisite cost was also not excessive. But the site of the third extension program (Lungwangtang) is situated more than fifteen miles west of Dairen. The intervening country is interspersed with chains of hills running in all directions. This renders the execution of construction work especially of the laying of leading main pipe line or conduit very difficult. Again, when at some future time, the fourth extension program has to be tackled with, the water source will have to be sought no nearer than Chinchou district, and a tremendous sum of funds will have to be laid out.

## II. History of Dairen Waterworks

The Dairen Waterworks was originally designed by the Russians as one of the varied installations requisite to the port and town of Dalny (now Dairen) and the railway, when they leased Liaotung peninsula from the Chinese government and planned to construct a commercial port at Dairen in 1901.

The Russian plan had not yet been completely executed when the Dairen Waterworks passed into the Japanese hands.

What was designed by the Russians was only an improvised affair on a very small scale.

It consisted of the following :—

Eight wells lined with stone, each 20-ft. in diameter and about 20-ft. deep, were sunk in the Malan river at South Shahokou at nearly four miles west of the city of Dairen in order to gather the underground flow in the gravel layer. The water so gathered was pumped and transmitted through 6 inch piping by two Washington



pumps, each of about 18 horsepower, to the service reservoir on Fushimidai heights, at the altitude of about 190-ft. above the sea level, to be distributed to the railway administration quarter (now called Roshia-machi) and the locality about the railway station.

Further, two wells were sunk in Higashi-Koyencho (at the east of the South Manchuria Railway Company's general offices). This is known as "Waterworks No. 2" which has subsequently been transferred to the management of the railway company. The water of this waterworks is supplied to the Dairen harbor and also the railway station.

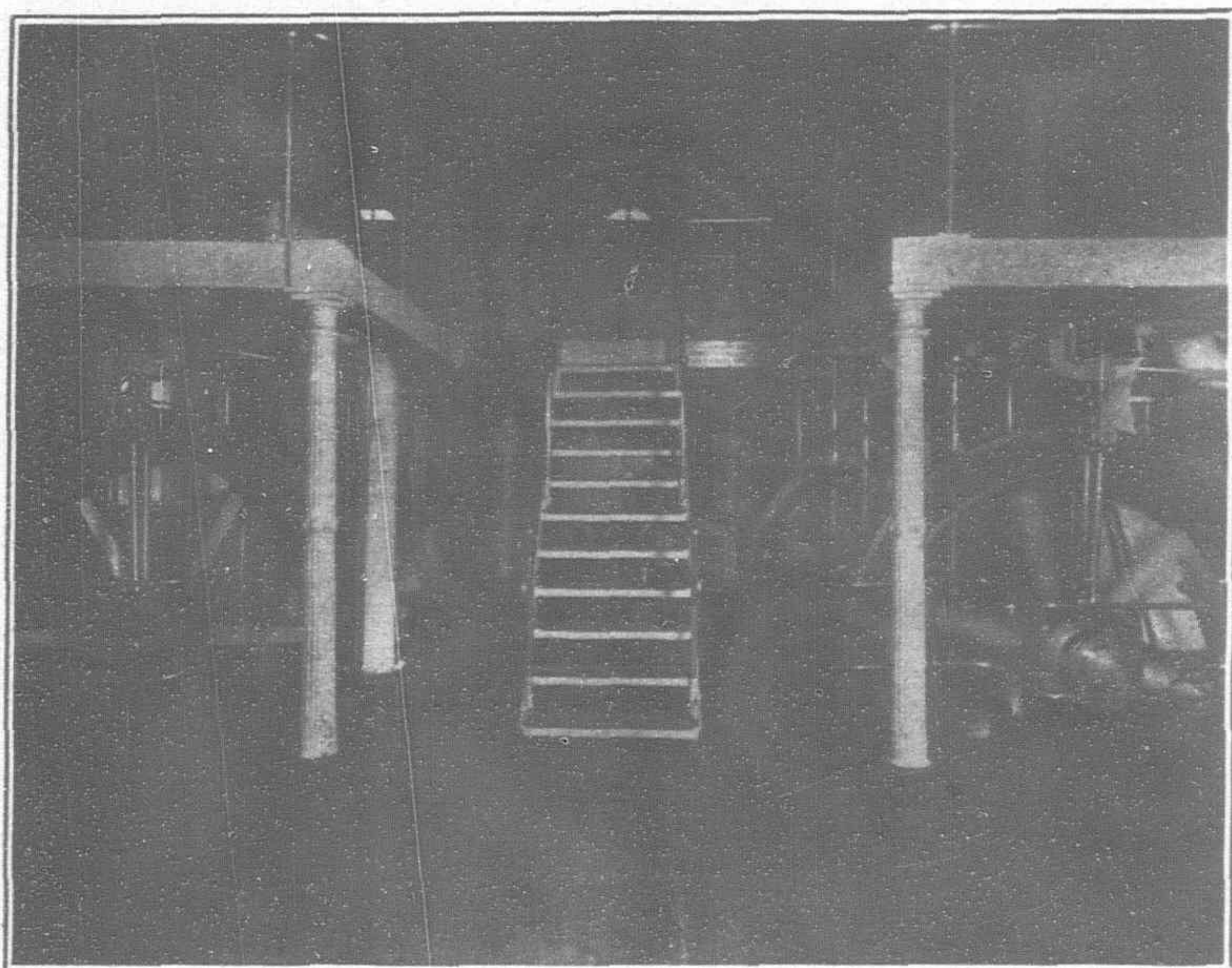
The maximum capacity of the above waterworks was only 1,000 tons at Shahokou and about 100 tons at "Waterworks No. 2."

and branch pipes. (Reference is invited to Chapter III). The items of the greatest urgency were taken up before the rest, and even prior to the completion of the construction work, the public began to be supplied through the newly laid forcing and distributing pipes in February, 1908.

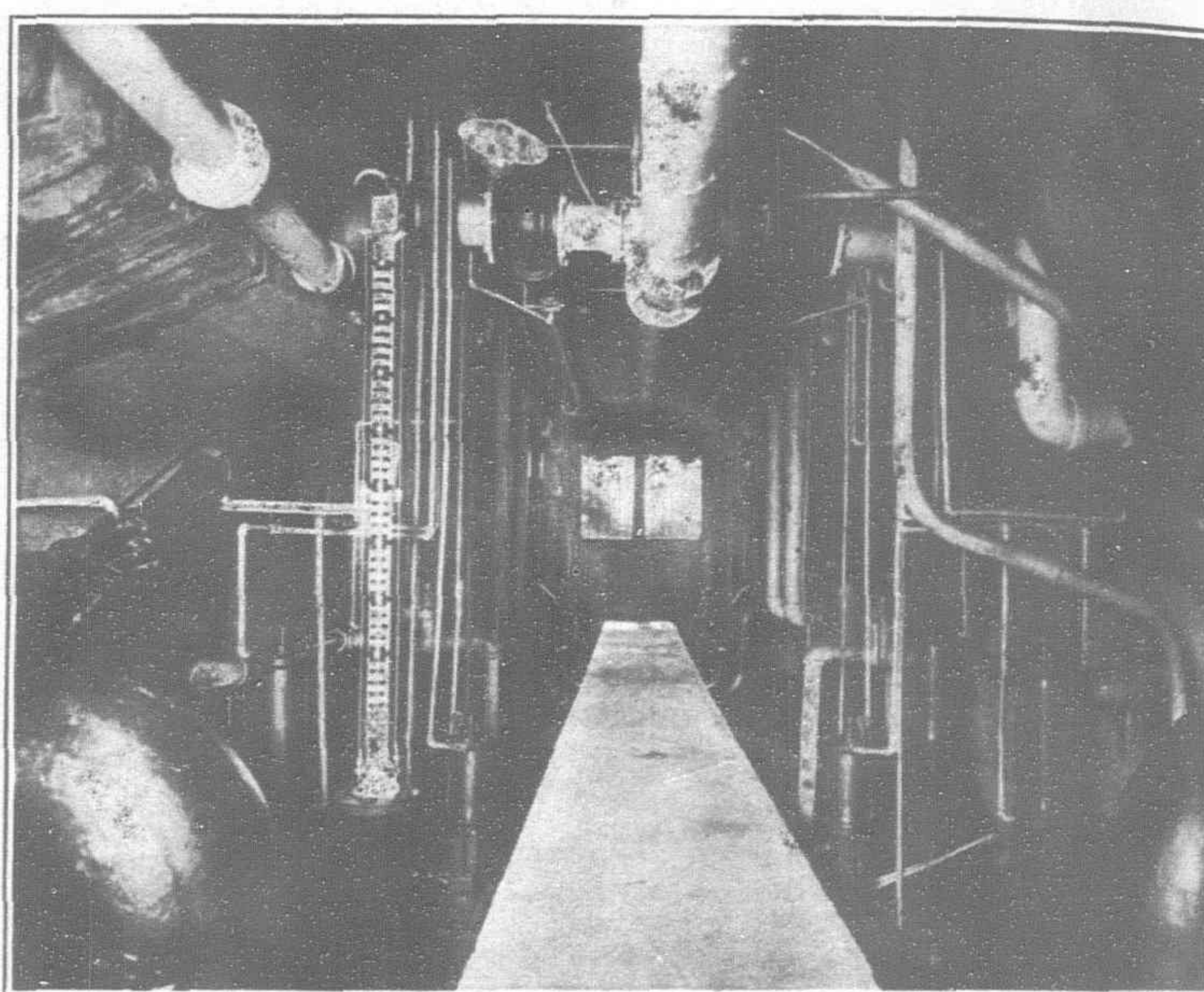
As the city of Dairen grew, the supply from the street hydrants not to speak of the private taps, increased steadily in the number of the clients and also in the quantity of consumption.

In July, 1911, a restriction had to be placed on the hours of daily water supply from the 3rd to the 13th. By July, 1912, the daily maximum consumption reached 6,100 tons, which was close to the limit of the supply capacity of the waterworks then existing. On the other hand, the rate of increase of the population of Dairen

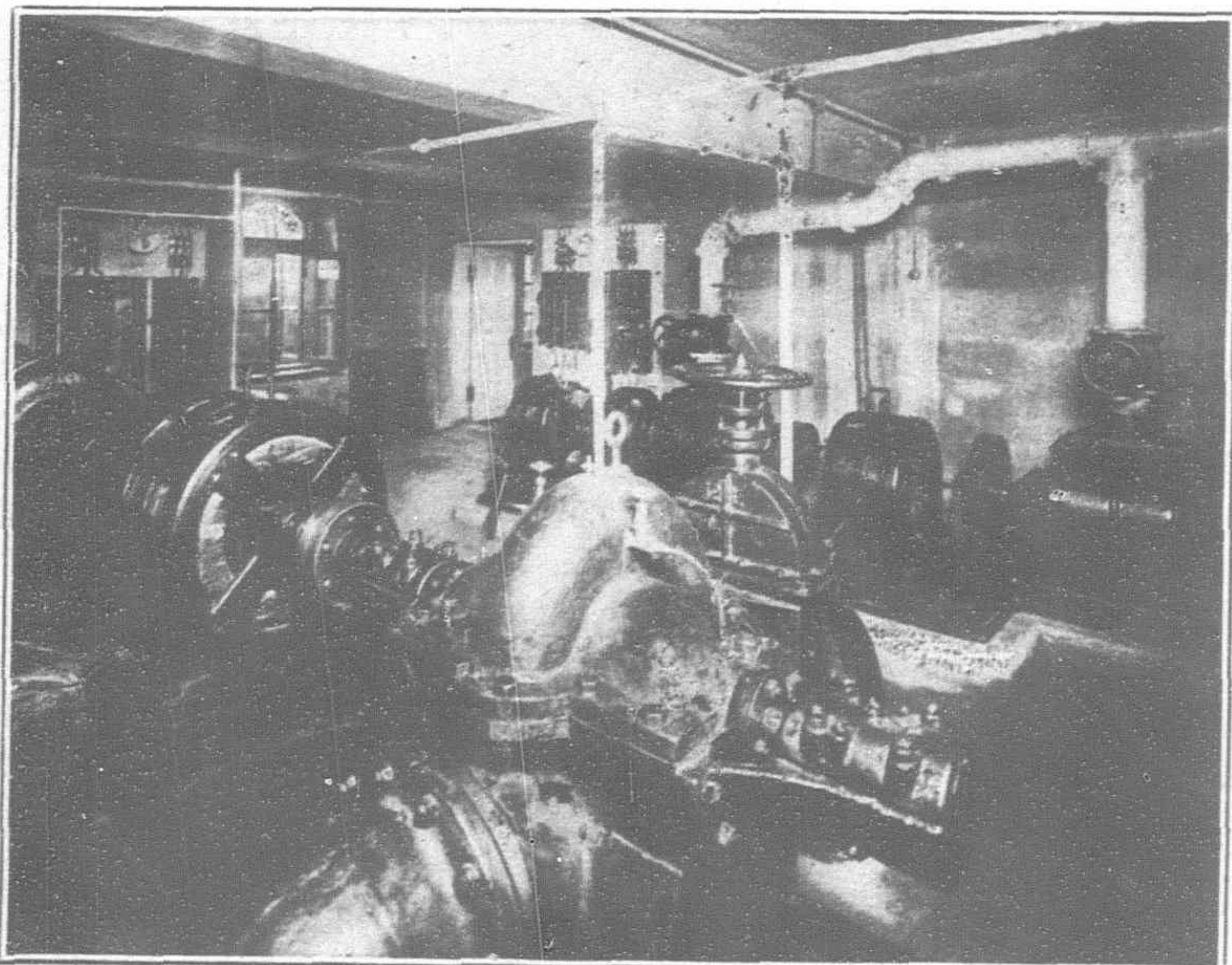
### SOME OF THE MACHINERY AT THE DAIREN WATERWORKS



Electric-driven Pumping Engines



Pipe Gallery for the Rapid Filters Underneath the Platform



Electric-driven Air Blowers and Centrifugal Pumps for Cleaning the Beds of Rapid Filters



Interior of the Boiler Room of the Pumping Plant

Therefore, in October, 1905, the first extension program was drafted. Work was put in hand in the following year (1906) at the estimated outlay of Y.1,060,000. It was completed in March, 1910.

This extension work involved the construction of a blind dam at the Shahokou water source and of a new settling reservoir and a filter bed, the installation of a new pumping station, the laying of a 16 inch forcing main pipe from Shahokou to the service reservoir, Fushimidai, and the construction of a new service reservoir at Fushimidai, together with the laying of the distributing main

and did not increase at some fixed rate of geometrical progression, as at so many cities in Japan and the Western countries. The rate of increase varied according to years, as might be expected of a new colony.

The population of Dairen at the end of 1907 showed an increase over the figure at the end of the preceding year by about 20,000; at the end of 1908, the increase over the previous year exceeded 8,000; since 1909, a somewhat regular pace of increase has been observed yearly, the annual increment ranging between 2,000



and 6,000. At the end of 1913, the yearly increase rose to about 10,000. At all events, the general situation of South Manchuria seemed to endorse the anticipation of a rapid growth in population at Dairen. The urgent necessity of extending the waterworks further was recognized. Under these circumstances, the second extension program was drawn up and was started as an undertaking extended over six years from 1914 to 1919.

On April 5th, 1914, preparatory work was commenced on the site of the new reservoir at Wangchiatien, and excavation work was begun on the 25th of the same month. The construction of the reservoir was finished practically on August 26th, 1917.

Before the completion of the work, in July, a heavy rain raised the water to the depth of 60-ft., and the construction work was pushed forward with concentrated energy day and night. By August 21st, the water of the reservoir went up to 73-ft. in depth, and the overflowing water created a large waterfall of 40-ft. in height over the steep cliff. The roars of the rolling water, with its whirls, bubbles and sprays, presented a splendid sight. The laying of a leading main pipe line of 20-in dia. from the reservoir to the filtration plant (淨水槽場) at Shahokou, the reconstruction of part of the settling basin as coagulation basin, the installation of new filtering appliance, the removal and installation of pumps, and the equipments for distributing water to the higher levels at Dairen were executed as expected, and by the end of 1919, by which time the construction work was to be finished, the whole of the principal parts of the work had been finished. The other minor parts, inclusive of the laying of the service pipes in the city, had been completed by the end of March, 1921, as planned at the outset.

Prior to the commencement of the second extension work, above mentioned, what with the increase of the water consumption from about 1913 and what with insufficiency of rainfall, a water famine began to be threatened, and the partial suspension of water supply had to be enforced:

Firstly, from November 11th, 1913, to March 14th, 1914;

Secondly, from June 11th, 1914, to July 4th, 1914;

Thirdly, from November 13th, 1915, to May 31st, 1916;

Fourthly, from October 20th, 1916, to July 31st, 1917.

In the last mentioned case, the partial suspension extended over nine months at a stretch to the untold misery of the citizens.

The authorities concerned were not idle or resourceless. They managed to draw some supply from Tayukou near Liushutun across the Dairen bay by means of water boats. Then, more supply was obtained from Ryojun (Port Arthur) in railway tank cars to fill the need of the locomotives. The effort of the authorities to make the best of the trying situation is worthy of special recognition in the annals of the Dairen Waterworks.

Since the completion of the Wangchiatien reservoir (according to the second extension program) which can hold 5,400,000 tons of water, the daily water consumption of the city of Dairen has kept increasing at a faster rate than before, but so far not a sign of a water famine has yet been seen.

Dearth of water from 1916 to 1917 was without a parallel. It was owing to the extraordinary drought extending from 1915 to 1916, combined with the sharp rise of water consumption due to the rapid increase of the Dairen population.

The second extension work, then in progress, could not be of any use before 1918, by which year the water of the new reservoir was expected to be sent to the Shahokou filter plant. Accordingly, the authorities, as an expediency, decided to found a new source at Lanchiatun (near Hsiaopingtao) at nearly eight miles west of Dairen with the object of keeping it as an auxiliary source of supply. So, in November, 1916, when the cold winter was literally at the threshold and even all kinds of outdoor building work have to be suspended, the work was started, and, in spite of the inclement weather, it was pushed on with admirable fortitude, being brought to completion on March 10th, 1917. This is what is styled "Auxiliary Waterworks at Lanchiatun." It cost Y.180,000.

The above, that is, the first and second extension works, with the Lanchiatun auxiliary waterworks, make up the existing waterworks installations. Their dependable supply capacity consists of 10,000 tons by the Wangchiatien reservoir and 2,000 tons by the Shahokou wells, which formed the first extension works (originally the estimated supply capacity was 6,100 tons a day, but the data during the dry season put 4,000 tons as a reasonable daily capacity. Since the completion of the Wangchiatien reservoir, the catchment area of the wells has been cut down by half), in addition to 600 tons by the Lanchiatun waterworks.

Calculating the per capita per diem consumption at 4.5 cub. ft. for a white and a Japanese, and that for a Chinese at 1 cub. ft., the present installations suffice for 60,000 Japanese and Westerners and as many Chinese, still leaving 3,435 tons for supply to the harbor, wharves, locomotives, the workshops, street sprinkling, fire-extinguishing, fountains, etc.

Such is a brief history of the Dairen Waterworks and the present supply capacity.

### III. Sketch of Installations

#### (a) Water Source in the Malan

The main water source of Dairen Waterworks is located in the Malan river running through West Shahokou at nearly four miles west of Dairen.

The Malan river has its source in Antzuling mountain, held as the second highest in the Kwantung leased territory, and flows eastward, then turning to the south, empties itself into the sea through South Shahokou. It is a small river and is about fifteen miles long, its drainage area being 37.5 square miles. In dry weather, the river has but little water, but at a heavy rain, the swift murky current is very often several feet deep. In this river, there are two water sources: one, in the form of the impounding reservoir at Wangchiatien, and the other in the form of the wells at South Shahokou.

#### Wangchiatien Reservoir

The Wangchiatien reservoir constitutes the principal source of supply to the Dairen Waterworks and is situated at Hanchiatun, part of village Wangchiatien, at 11½ miles northwest of Dairen.

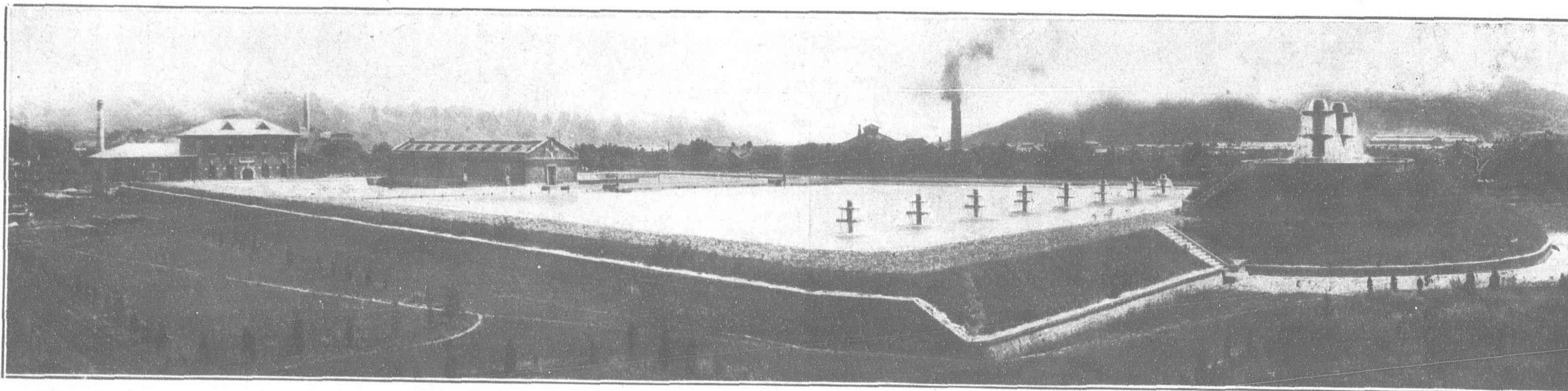
This reservoir was constructed, as above stated, on the principle of depending upon the reservoir system alone for a steady reliable supply.

In order to determine the size of a reservoir, it is necessary to conduct a minute investigation regarding the rainfall in the drainage area, together with the evaporation, percolation and actual run-off. Accordingly, in June, 1911, a temporary observatory was founded at Chakou, in the centre of the catchment basin, in order to conduct observations of all these natural data in addition to what had been carried on at the meteorological observatories at Ryojun (Port Arthur) and Dairen. Moreover, between May, 1911, and May, 1913, a weir was constructed at Shahokou for the purpose of measuring the amount of ground water flow and, at the same time, we calculated the amount of subsoil flow by the quantity of water pumped up to the settling reservoir of the waterworks by the intake centrifugal pumps.

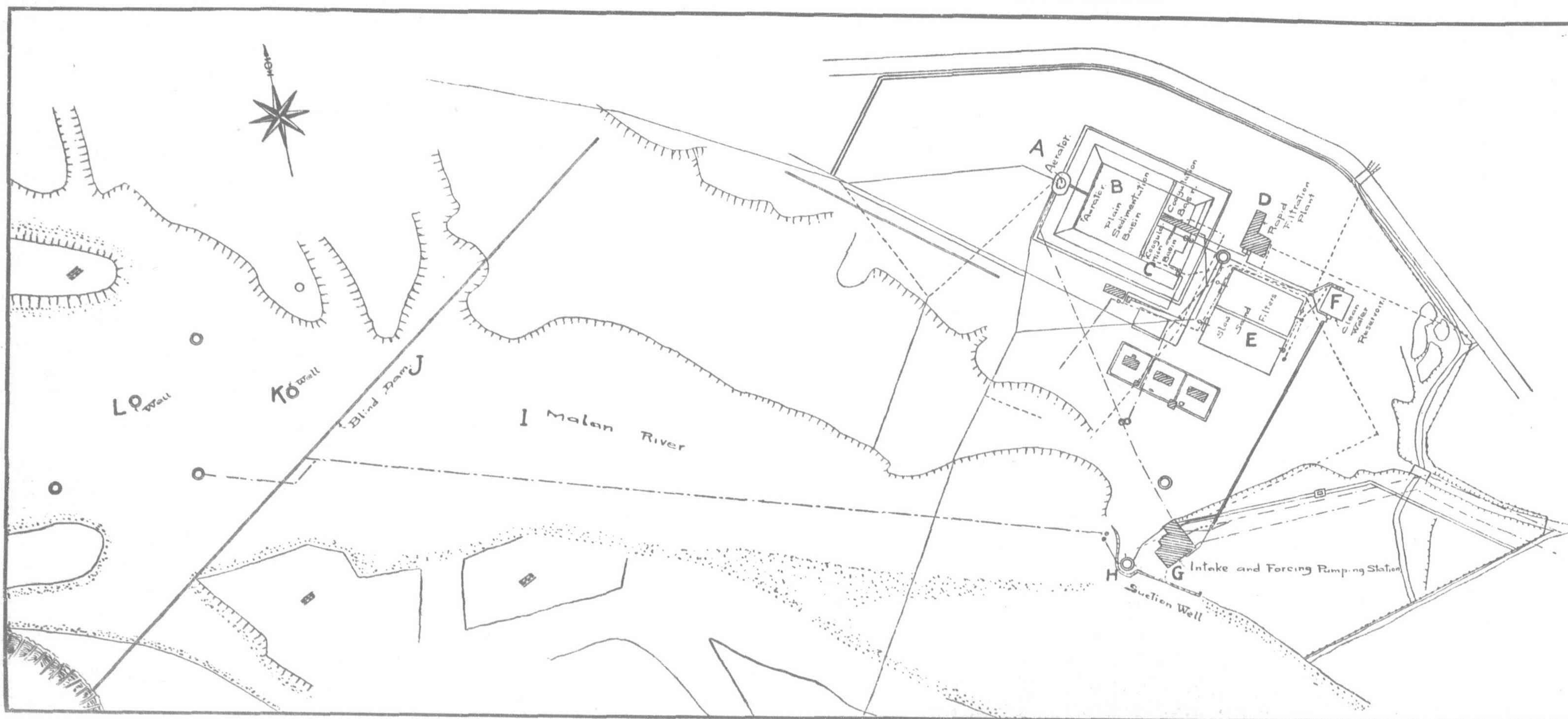
Thus, the actual flow of both surface and subsoil run-offs, at Shahokou, was measured, and also on the site of the new dam under contemplation, another watergauge weir was constructed. At the time of a freshet, the flood flow was measured actually. A minute survey was carried out of the catchment area to the new reservoir from May, 1911, to August, 1912.

Generally speaking, the co-efficient of discharge, i.e., the percentage of run-off to the total rainfall in a catchment area, will vary with many factors such as the season, frequency and intensity of rainfall, velocity of wind, and humidity of air or of ground. So, it is difficult to find out a rational co-efficient which applies to all conditions of the influencing factors. Therefore, there will





General View of the Water Purification Plant of the Dairen Waterworks at Shahokou



GENERAL PLAN OF SHAHOKOU WATER FILTRATION PLANT

A. Aerators  
B. Plain Sedimentation Basins  
C. Coagulation Basins  
D. Rapid Filter Plant

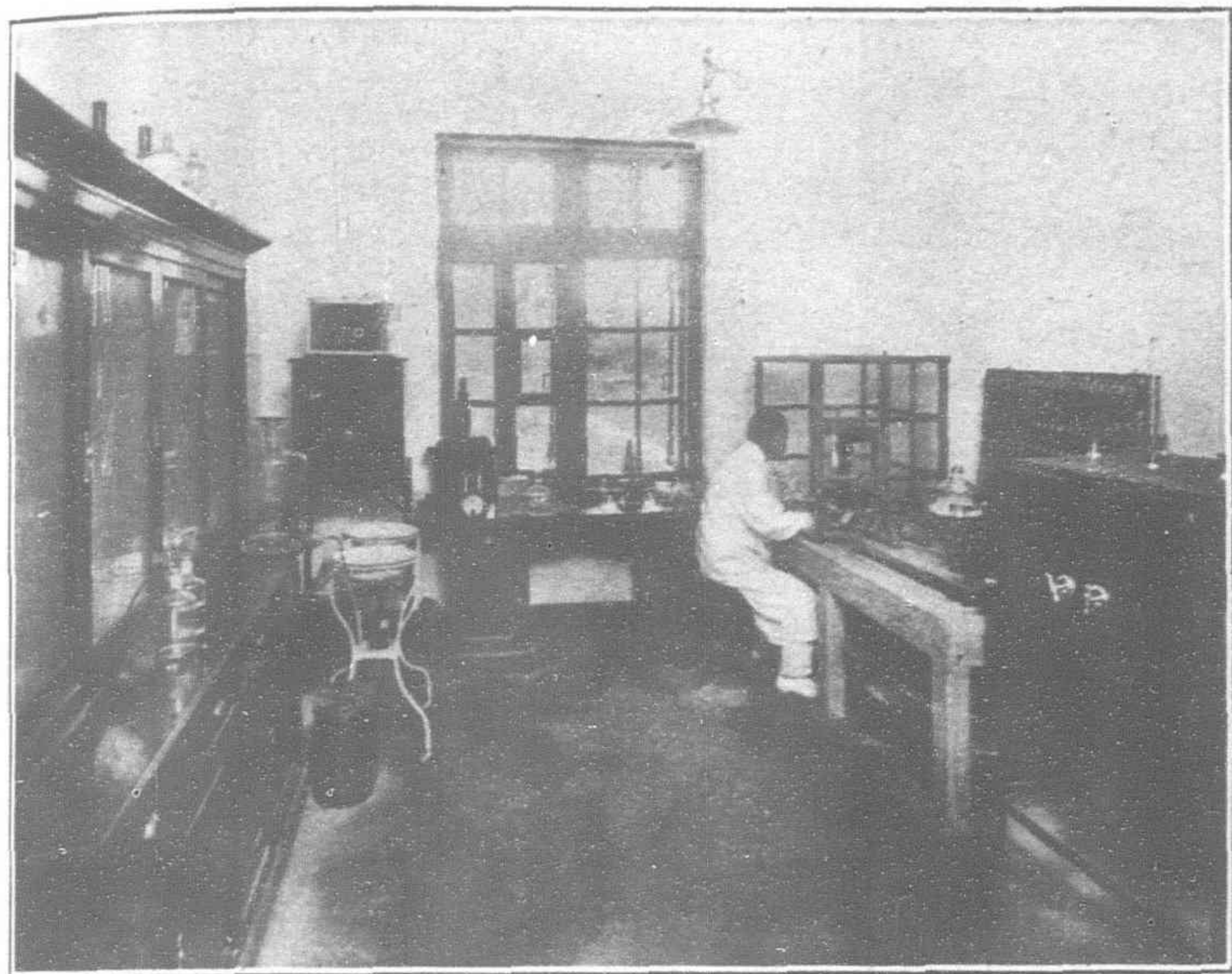
E. Slow Sand Filters  
F. Clean Water Reservoir  
G. Intake and Forcing Pumping Station  
H. Suction Well for Intake Pumps

J. Blind Dams  
K. Wells



be only two ways to determine the co-efficient: (1) by determining the monthly co-efficients by the long period observation or (2) by determining the co-efficient according to the amount of rainfall in some specified duration of time.

In our case, the results of the actual observations showed that, in case of the monthly run-off being considered, it varied most remarkably according to the quantity of rainfall during the month. A curve showing the relation of monthly run-off and rainfall was



Interior of the Laboratory for Examination of Water in the Rapid Filter Plant

obtained by an analytical study of the results of the above observations. These rates of run-off were used, in their turn, as the basis for calculating the quantity of the water that has flowed into the reservoir from the catchment area during the past several years. From this amount the evaporation amount was deducted (the leakage and percolation amounts were left out of account on the assumption that there was some allowance left in the evaporation amount).

The results of these calculations were shown on a diagram, and by what is called the yield curve method, the dimensions of the reservoir in project were determined, taking into consideration the topographical features of the proposed site for the reservoir.

The dam of the new reservoir was constructed at the neck of the Wangchiatien dale where the spurs of two hills embracing the dale slope down nearest each other, and is situated at a distance seven miles from the Shahokou filter and pumping plants.

It is built of rubble-concrete and of gravity section, and in plan, it forms an arc having a radius of 1,742½-ft. in order to give it an additional strength beyond calculation, to be in harmony with the topographical features, and also to abut it to the solid rocks at both ends. The rocks at both ends of the dam, to which it abuts, are formed of quartzite of considerable hardness. The gentle slope on the left bank is availed of for the construction of both the overflow and overflow channel, which latter discharges the waste water from the precipitous cliff, some 300-ft. distant from the dam, down into the river. At about the middle of the main body of the dam (the overflow portion being excepted), and intake tower is constructed.

Within the tower, a 22 inch cast iron pipe is erected and, by means of four 10 inch branch pipes, which project out of the tower at the interval of from 14½-ft. to 16-ft., the water is conducted to the leading main pipe. The leading main pipe has the diameter of 22 inches while in the dam, being reduced to 20 inches outside the dam. The drain pipe is 24 inches in diameter, and is installed against emergency. Both the leading pipe and drain pipe are laid in the pipe gallery to facilitate inspection.

In the part of the main body of the dam adjoining the overflow portion, a projection of 6-ft. each, both above and below the dam,

the total width at the top of the dam being 22-ft. with 20-ft. in length, is made. On the down stream side of this projection, a flight of steps is made down to the river bed. This is intended, in addition to necessity, to enhance the appearance and, at the same time, to reinforce the strength of the dam.

The following is the dimensions of the dam and the reservoir:—

#### (a) Dam

Length (overflow portion being excepted) ...	707.46-ft.
Height, maximum (depth of trench not being included) ...	96.00-ft.
Width at top ...	11.50-ft.
Width at bottom, maximum ...	67.43-ft.
Superelevation ...	5.00-ft.
Top of dam (above sea level) ...	282.00-ft.
Volume of the body of dam (1 <i>tsubo</i> being equal to 216 cub. ft.) ...	5,545 <i>tsubo</i>

#### (b) Over-flow Length

(of which 84-ft. being the overflow portion of the main dam and the remaining 298.3-ft. being the length of the overflow weir specially made, projecting into the reservoir on the left bank.)

#### Reservoir

Catchment area (1 sq. <i>tsubo</i> being equal to 36 sq. ft.) ...	9,435,790 sq. <i>tsubo</i>
Storage capacity (available) ...	5,348,883 tons
Storage space (maximum) ...	204,364 <i>tsubo</i>
Maximum altitude of water (above sea level) ...	277-ft.
Maximum depth of water ...	73-ft.
Effective depth of water... ...	63-ft.
Altitude of lowest bed of reservoir ...	204-ft.
Length of reservoir ...	9,900-ft.
Greatest width of reservoir ...	900-ft.
Circumference of reservoir ...	5½ miles
Number of houses removed, which would have otherwise been sunk into the reservoir ...	30 houses

The top width of the dam is 11½-ft. On the downstream side, it is perpendicular for the length of 13-ft. from the top; for 9.3-ft. further down, it makes a circular segment of 30-ft. in radius, and for 6.4-ft. below it slopes at the grade of 59/100 and the remaining part at the grade of 69/100. The upstream side is vertical down to 29-ft. from the top; for 20-ft. further down, the gradient is 6/1000; and for the remainder down to the foundation rock, the gradient is 2/1000.

At the bottom of the upstream side of the dam, a cut-off trench, 10-ft. wide and 10-ft. deep, is constructed. The downstream side is faced with concrete blocks, of the proportion of cement 1, sand 2, and gravel 4. The blocks are of two kinds—one being 1.2-ft. square and 2-ft. thick, and the other being 1.2-ft. high, 2.4-ft. long, and 1.2-ft. thick. Along the top, the facing blocks are fashioned in the shape of series of arches for ornamental purposes.

On the upstream side, for the depth of 40½-ft. from the top, granite blocks of 1½-ft. square and 2½-ft. in thickness are used, and for the rest, concrete blocks are used as on the downstream side.

These granite stones are used to provide against the freezing action of water, as well as against the shocks which might be received from some floating objects in case of inundation and violent wind. The thickness of joints is half an inch, the mortar used being of 1.2.

(To be Continued).



# KOREA'S GOLD

**G**OLD mining is one of the most important industries in Korea, and until recently has been prosperous—one at least of the companies engaged therein having paid 50 per cent. dividends for many years. The present state of the industry is now described as precarious in a report furnished by His Majesty's Consul-General at Seoul (Mr. A. H. Lay, C.M.G.) to the department of overseas trade. Until recently no sign of improvement was noticeable in the adverse conditions which first set in during 1918, and of which the principal factors are—

1. Increased cost of labor and supplies.  
2. Provisions of the mining law of 1915 adverse to foreign enterprise.  
3. Taxes of various kinds.  
4. Restrictions on timber-cutting for fuel purposes.  
5. The financial depression.  
6. Bad transportation facilities.

With regard to the first factor, wages have increased on the average 50 per cent., and at the same time an eight-hours day has been substituted for a 12-hours day at the new rate of pay. Of the two kinds of labor employed, Korean and Chinese, the former has deteriorated in quality. Since the political troubles that broke out in 1919 the Korean has become restless and is no longer as amenable to discipline as formerly. There have been strikes in all the mines, an occurrence unknown in earlier days.

## Chinese Labor

Chinese labor, which was once cheap and plentiful, had not returned in 1919 and 1920 owing to the rise in the price of silver. The Chinese remit their money home, and it does not pay them to work in Korea when the purchasing power of the yen falls considerably as compared with the dollar. Silver has now again fallen and the Chinese will probably return.

The mining laws of Korea do not in themselves compare unfavorably with those of other countries, notably America, but foreigners suffer a

very real disadvantage in that they are unable to register claims in individual names, but must employ a Korean or Japanese as nominal owner. The former foreign concessions may transfer their claims to other foreigners by special treaty privilege, but in order to register new claims, they must first form a Japanese company. It is clearly not desirable to form a company until a claim shows sufficient gold-bearing ore to justify the step.

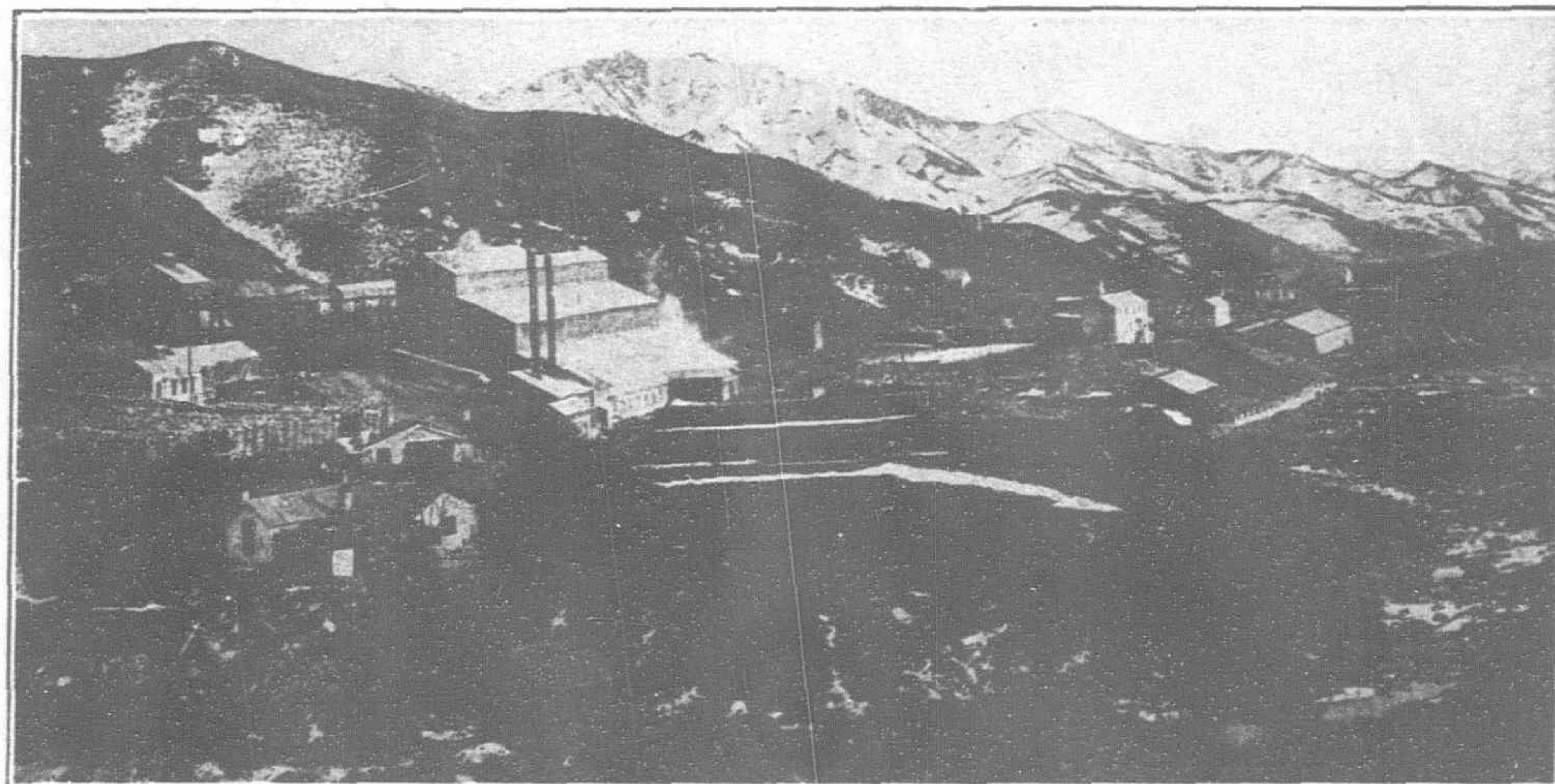
## Taxes and Restrictions

The principal taxes which operate unfavorably are as follows:

Area (or land) tax, 60 sen per 1,000 tsubo (1 tsubo = 36 sq. ft.)

Royalty, 1 p.c. on value of gold produced.

Income tax, 7½ p.c. on net profits (companies registered in America pay double tax).



The Oriental Consolidated Mining Company's Gold Mine in the Unsan District, North Heian Province

With regard to the restrictions on timber cutting the governor-general of Korea is very anxious to reafforest the country, which has been denuded of trees in the course of centuries. The lack of trees leads to disastrous floods at the season of heavy rains,

while their increase will bring about in time a more even distribution of the rainfall. Cheap fuel is an important item in Korea for all mining industries, and the principal mines are distant from the railways and the transport of coal adds considerably to costs.

In this connection, it may be noted that, of the five foreign mining concessions operating, three use coal only for motive power, one wood only, and one uses hydro-electric power. Coal in 1914 delivered at the mine cost Y. 6.50 per ton, and in 1920 Y. 23.00 to Y. 35.00.

## Mines in Operation

At the present moment the gold mining industry is principally in foreign hands, chiefly American. Some of the companies are, however, worked partly with British capital. Approximately 30 per cent. of the shares represents British money.

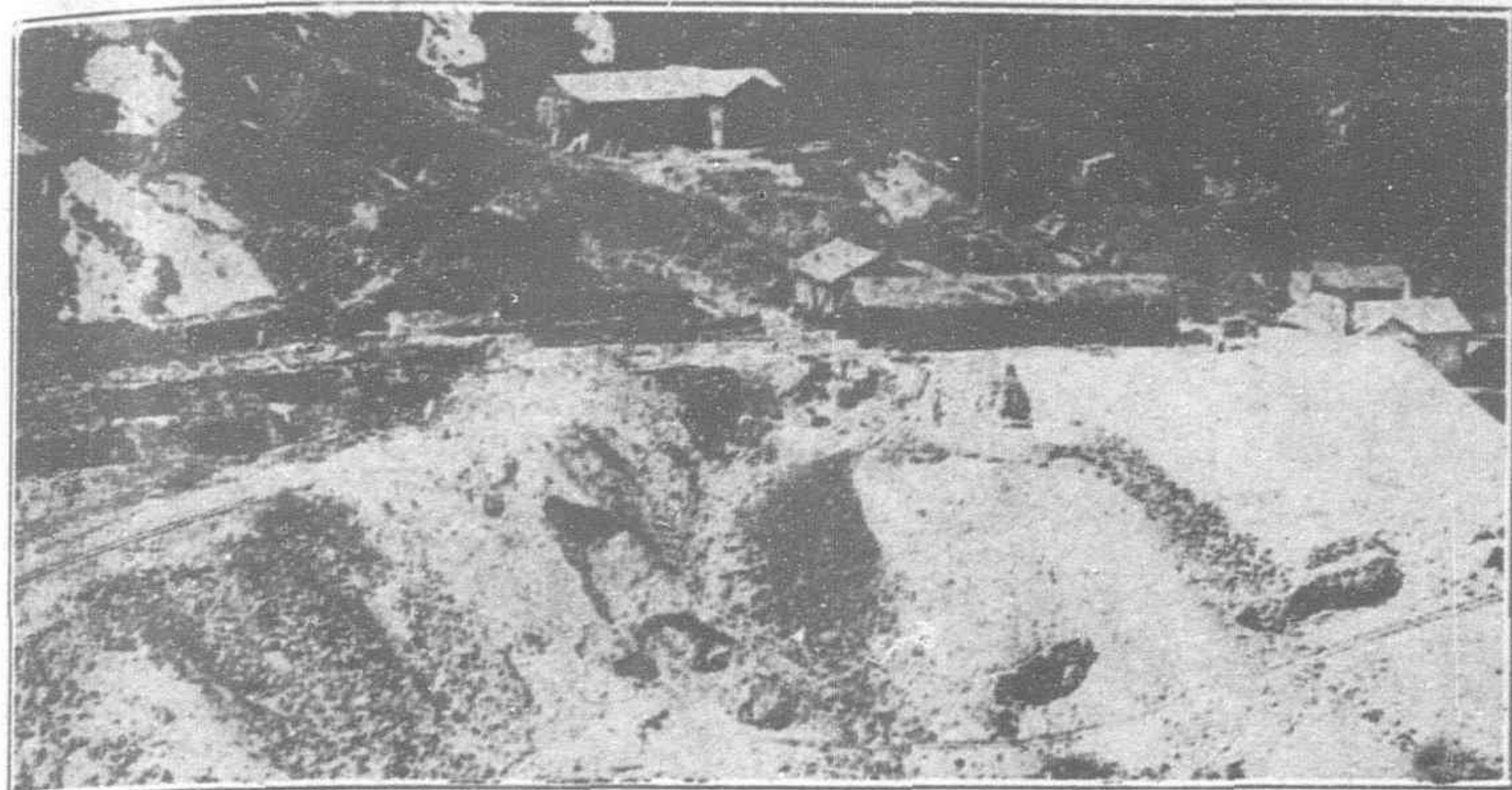
These companies are:—

(1) The Seoul Mining Company.

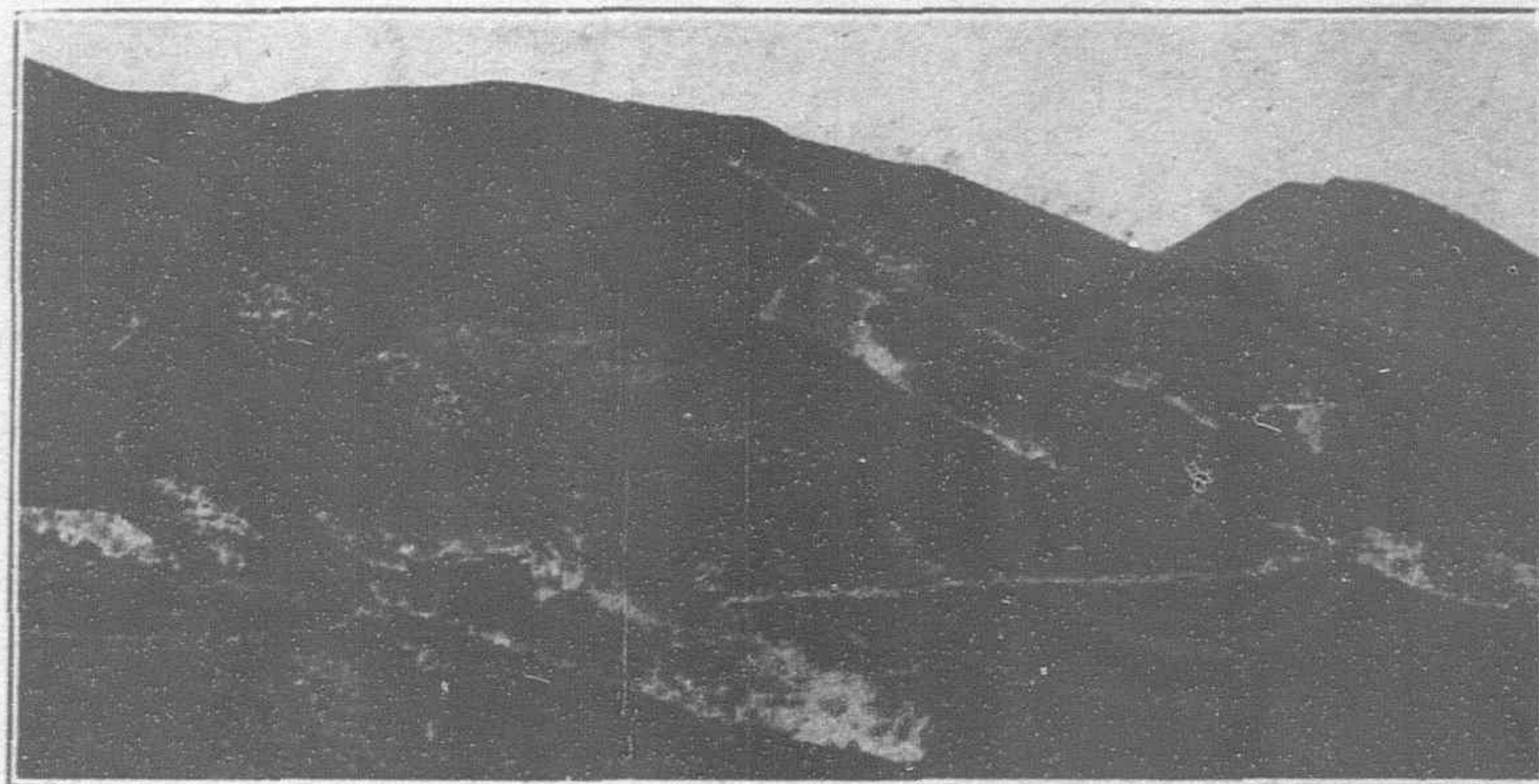


Chiksan Gold Mines: Korea Front view of Gold Dredge showing heavy steel structure—Front Gantry and bucket line digging 22 feet below surface





The Main Portal of the Suan Mine: The Seoul Mining Company



The Tul-Mi-Chung Mine in 1918: The Seoul Mining Company

- (2) The Oriental Consolidated Mining Company.
- (3) The Chiksan Mining Company.
- (4) The Asian Mines, Limited.
- (5) The Concession Minière Française de Taiyudong Chang-Song.

Of the above :—

(1) The Seoul Mining Company has its chief mine at Tul-Mi-Chung, about 50 miles east of Pyeng-Yang. It operated at a loss in 1920, when Japanese and American taxes had been deducted from the gross revenue. Operating costs (exclusive of taxation) amounted to G. \$5.9378 per ton of ore. It works six mines. The mine at Suan, one of the best in former years, has now been practically worked out.

(2) The Oriental Consolidated is situated at Unsan, about 60 miles north-east of Ansho. Its operating costs worked out at G. \$3.67 per ton of ore. Dividends of 5 per cent. were paid.

(3) The Chiksan Company is situated at the place of that name, about ten miles from Seikwan on the Fusan-Seoul main line. It paid dividends of 8 per cent.

The above three companies are American.

(4) The Asian Mines is registered as a Japanese company and is worked and owned by British capital. It is situated at Yang Duck, about 50 miles east of Pyeng-Yang. So far only prospecting has been done.

(5) The French Company suffered a small loss in 1920. It is privately owned and the capital, so far as is known, is entirely

French. The mill was shut down during 1920, but it was to resume work on May 1 last. The mine is situated at Taiyudong, about 15 miles north-west of Unsan.

### Japanese Companies

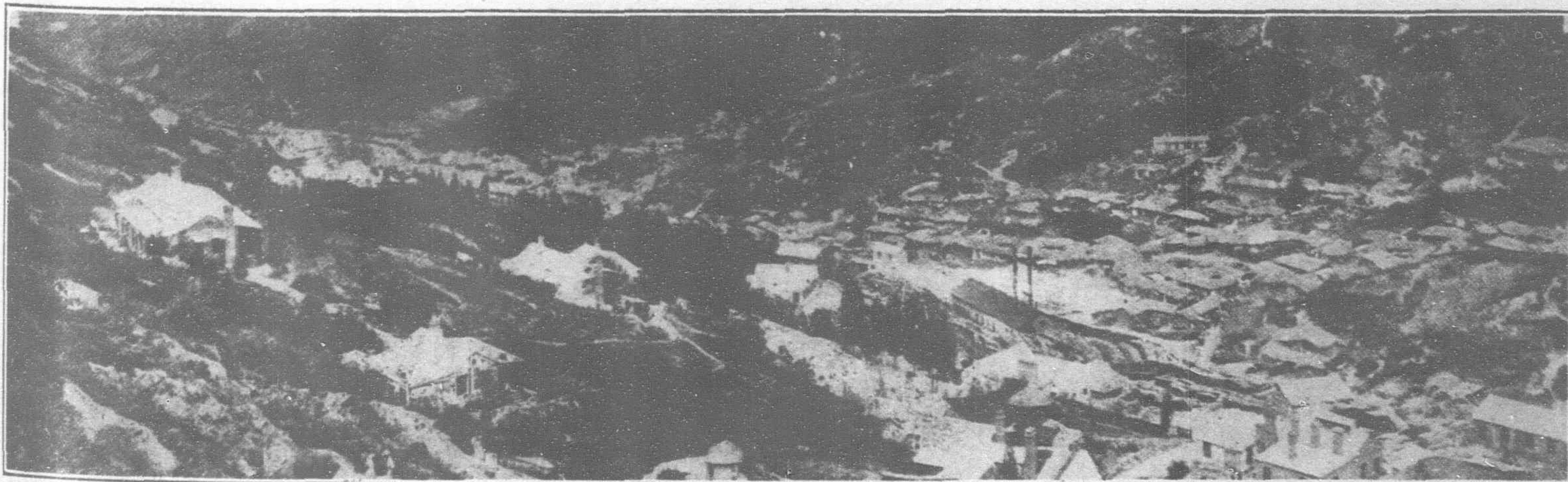
Several purely Japanese companies have at various times and places endeavored to extract gold, but their wasteful methods, particularly in the number of the staffs employed and the want of knowledge and experience, have caused them to fail in every instance. The Japanese are now turning their attention to the development of other minerals, such as copper (found in most of the gold mines), tungsten, graphite and especially coal. As early as April, 1920, applications for gold-mining claims had ceased and 50 per cent. of the claims registered were for coal.

A not inconsiderable quantity of gold is extracted by native workers, both miners and p'acers, using primitive tools and with little capital.

They succeed in obtaining gold in the small lodes and in good mines where gold can be extracted without the use of much machinery. The Koreans have a natural instinct for gold-mining and will frequently judge the capacity of a vein sooner than the trained experts, but they fail when scientific methods have to be employed, as, in common with the Japanese, they have no proper knowledge of the use of machinery and explosives. Some of the native workers sell their output to the foreign concessions under contract.



The Foreign Residences at Tul-Mi-Chung: The Seoul Mining Company



The Suan Mines: The Seoul Mining Company



# The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI CHINA

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## The American Court and Extraterritoriality

WHEN so prominent an American newspaper as the *Herald* of Boston, Mass., announces editorially that the coming investigation into the American court dispute at Shanghai offers a suitable opportunity to consider the whole question of the court in China having in mind a complete withdrawal and the placing of all Americans under the jurisdiction of the Chinese courts, then indeed the time has come for a frank discussion on the subject in these columns. The *Herald* says that President Harding cannot but regret as much as any one the necessity for an investigation of conditions in the United States court at Shanghai. But as he has felt it his duty to issue the order, the inquiry will doubtless be thorough, with a view to rectification of whatever may be wrong, and prevention of similar occurrences in the future. Americans in China whose pride of country is such as to deplore a public attack upon the government's representative must feel, while they deplore, that respect for authority will suffer, dignity of office will be ridiculed and lowered and, last but not least, the application of the law so demeanoured as to make of the unfortunate episode an example whereby a claim for the abolition of extraterritoriality can be supported. It is not proposed to register a partisanship in these columns except in so far as to make the statement that however necessary an accusation of distrust against the court might have been, the abrupt and public manner in which it was done surely reflects a mind ill-advised. If, as it is claimed, the United States court at Shanghai can actually be credited with propensities which call for distrust, surely there is a better way to effect a remedy than to besmear American repute by a process at once passionate and startling. It is not necessary at all for Americans to apologise for Americans in an international community in itself not immune to apparent misrepresentation of the law, but it is necessary for Americans to make an attempt to prevent a recurrence of a spectacle that may be used as a wedge to deprive them of the privileges of extraterritoriality. Already the *Herald* of Boston, Mass., inquires, "While our state department is looking into the conduct of this American court in China, might it not advantageously consider the whole question of our courts in that country?" It goes on to say "caution at first may have dictated our imitation of the European powers in their relations with China. They distrusted the Chinese administration of justice, and insisted on setting up courts of their own at the capital and the treaty ports for the trial of all cases, both civil and criminal, in which any of their nationals were concerned. That assumption of European superiority, plainly implying Asiatic inferiority, has never been conducive to friendship between the peoples of the occident and those of the orient. Japan tolerated the system of foreign consular courts for a good many years, but at last she resolutely declared that it must cease, and therefore extraterritoriality for foreigners in Japan was abolished in 1899.

"The Chinese have chafed under the same system, and are intent on getting rid of it. They are not now a dumb mass under a Manchu autocracy, and the nations will be wise that treat them as a self-respecting and a self-governing people, consolidating their

power as an independent republic. In this matter of the exclusion of foreign law courts they have begun with Germany, the nation whose ruler not much more than twenty years ago said to his soldiers: 'Use your weapons in such a way that for a thousand years no Chinese shall dare to look upon a German askance. Be as terrible as Attila's Huns.' Germany has agreed in the treaty of peace with China that there shall never more be German courts in that country, and that Germans residing there shall be subject to the jurisdiction of the Chinese courts, except in civil disputes among Germans only, which a German minister or consul may decide.

"China will propose the inclusion of similar provisions in every new or revised treaty to which she is a party. We have given her several practical proofs of our friendship. Perhaps she would think it the crowning proof if, without waiting to be asked, we arranged for the withdrawal of United States courts from her cities and the acknowledgment of her national courts by American residents. A full consideration of the *pros* and *cons* by the president and the state department is desirable, and it is suggested now because the Shanghai investigation appears to offer a favorable opportunity."

With all due deference to our friends the Chinese and with an expression of admiration and respect for the great soul of the people, it must be stated that the benefits of extraterritoriality are not mythological. Many are the factors which might be presented in an argument designed to support this contention, all so obvious to the sojourner in China that they need not be enumerated herein, but for the benefit of the American in the homeland whose *largesse* prompts at all times a stand in support of a China entirely for the Chinese and untrammelled by the influence of the foreigner, it might be wise to point out one serious consequence of a rescinding of the present treaty. Maladministration of justice so acute as to make business intercourse almost an impossibility. And it is business which has lured, and still lures, the American to China's shores.

It is unfortunate that evolution does not spin its way along with greater velocity. If it did the result of China's later day upheavals might already have made this protest against the abolition of extraterritoriality unnecessary, for there is no doubt that the storm which has centred, and still centres about China, will, in the course of time, make of the people their own masters. There can be no doubt that with all their short-comings, short-comings not unknown by any manner of means in the greatest countries of the world, the Chinese people are essentially fitted for peaceful and competent progress. Naturally lethargic, this progress will be slow, nevertheless it will be in keeping with all the conditions of the country, which, until the western world has inculcated modernism with greater promise of benefit to the country as a whole than modernism has benefited itself, must of necessity remain, in the eyes of the foreigner, squalid, unproductive. In the eyes of the Chinese their methods of living and environment are quite acceptable so much so that a calm contentment is evidenced throughout the whole breadth and length of the land, a contentment which is not duplicated elsewhere in the world. If the foreigner were placed in the position where his welfare, in respect to the law, was in the keeping of this great peace-loving and law-abiding people, then there could be no reasonable opposition to the abandonment of extraterritoriality. Were the danger of not being imposed upon incurred in graciousness of spirit, gentility, and considerateness, the status of international intercourse would be greatly different to what it is to-day. This defect in the make up of human nature, especially evident in the white races of the world, has made of boundaries, armed barriers; of intercourse, a matter of sharp edged diplomatic skill; and of the people of the world, as a whole, prey to savagery. Militarism of the unbridled type, such as has long been encouraged in China by the supply of arms and ammunitions from abroad, found itself entirely unchecked after the overthrow of the Manchu dynasty with the result that selfishness, greed, complete disregard for manly and lasting virtues and for justice in any form, prevail as masters of a



peaceful people. Until this element of arrogant irregularity is removed there can be no possible relinquishment of the privileges enjoyed by the foreigner under the extraterritorial law. There are signs that this great country will lift up and discard its oppressive burden, and when this time has come the foreigner abiding in China will be the first to applaud and to welcome complete Chinese administration unfettered by treaty rights and other embarrassing reservations.

There is a tendency both in Europe and America to view the privileges as enjoyed at present by the foreigner in China as matters of unwarranted imposition. They would be if conditions did not make of them absolute necessities, a factor generally lost sight of in the sentiment sprung reasoning of the distant onlooker. The fact must be emphasized that the time is not ripe for even a slight unloosening of the foreigner's treaty rights in China much as the wish might influence the deed, and a step in this direction would be foolhardy, tantamount to a recognition that existing authority, an authority unquestionably abhorrent, marks a status of sublimity or a level of superiority unattainable by any other form of government. No one who knows China can agree that such recognition should even be thought, let alone extended.

And so it is that any movement towards the abolishment of extraterritoriality must be attacked as being ill-advised, premature. The time will come, no doubt, when the subject may be embraced with perfect assurance of safety. This time is not now, and will not be for many a day. That the American court episode in China should form a comparison whereby the administration of Chinese justice might appear to advantage, that it should form a stepping stone to relieve the rights of Americans in a misgoverned country, are factors which must be deeply deplored, deeply resented, by all who have the interests of their own country, and of China, sincerely at heart.

C. L.

## Conciliation

A SPIRIT of conciliation is becoming manifest all over the world. The cynic will have it that this comes through necessity; that there is no other way out of the tremendous burdens that weigh down the world and the alarming calamities which threaten mankind. In other words, he thinks that selfishness and the eye to the main chance have again, as they always have done, prompted a desire for the relinquishment of the policies and ideas that guided the world before the great war.

Human nature is a strange driver. With whip in hand he has urged the old horse until lathered chest, panting flanks and a marked decrease in pace have combined to question the possibility of his arriving at any destination; whether or not there will be a breakdown on the wayside where the wolves and the mighty birds of the air will growl and hiss at each other over his carcass. This incautious riding over rough roads, disregard for obstacles which, if respected, might have delayed exhaustion until nearer the journey's end where the possibility of rescue would have been greater, indicates a desire for suicide. His mania for speed, for achievement at all costs, have blinded him. The sweat of his brow drips over his eyes and he plunges to his destruction, but no, the old horse begins to lag, no longer is urged by the cut of the whip. The old cart joggles where it previously rocked and is in danger of breaking to pieces. The driver pauses to wipe the sweat from off his brow and the old horse slackens considerably.

This little parable portrays man's work upon the world. Both he and the world are tired and the road before them is dark and dangerous. And if he does think of himself and the morrow, it is a selfishness that is a wise one, so the cynic may sneer if such is his desire. It will not effect the issue. As the thirsty seek for water and the pained seek relief, so now does the world seek rest. After the war there came a period of extreme and unwarranted optimism, when everybody in the allied countries rejoiced so greatly over the defeat of Germany that cool, collected

reason was almost entirely eclipsed. That dreadful spectre of Teuton domination having been overthrown, the world was apparently about to settle down to perpetual tranquility and the attainment of universal brotherhood.

And this might have been, but to quote from the *Traveller of Boston, Mass.*:—

"In the peace councils, the beautiful came face to face with the practical; the vision of brotherhood was more or less defaced by the very mundane contentions of rival governments cherishing old hatreds and aroused to new ambitions. The outcome was a treaty of peace, coupled with a league of nations covenant, both of which reflected the admixture of idealism with sordid reality. Thus another phase of bickering and contentiousness was already manifest while the treaty was in the making. And in a few months the first phase of optimism had passed completely over into the second phase, of bitter conflict. In the United States, intense heat was generated over the issue of treaty ratification. Of course, if America had assented at once to the treaty, less difficulty might have been experienced abroad in tying up the loose ends and securing German compliance. On the other hand, it can be claimed that there would have been a reaction in Europe, an era of quarrelling over the treaty, no matter what the United States had done. No one can say for certain what would have happened. But we know what did happen. Germany raged wildly over the iniquity of the peace pact. Italy flared up on the subject of Fiume. France grumbled and threatened. China pointed to Japan and cried 'Stop thief!' All nations had their domestic troubles over strikes and high prices and natural or artificial shortages of food and other necessities. Great Britain was in turmoil over Ireland and other parts of the empire that threatened to break away. The situation is too near and too familiar to require further description.

"Now at length, by some mysterious process, the world enters a third phase. Strife has to some extent subsided. That early optimism, having none too sound a basis, has not reappeared. Perhaps it is best that it should not. But new and more substantial hopes are being built upon the facts that Germany has consented to fulfil the treaty; that industrial disputes are less in evidence; that prices have begun to decline; that France and England are reaching an agreement on Upper Silesia; that Ireland and England have resolved upon an attempt to negotiate a peace; and that America's influence for harmony in international affairs begins to be seen once more as something potent and sincere.

"The world will continue to have its downs and ups. At present, speaking in a broad sense, it is neither 'up in the air' nor 'down in the dumps.' Rather, it may be said to be climbing, slowly but surely, to its feet."

Particularly is this last paragraph to be noted. Our friend the driver cannot relieve himself suddenly of that mad desire for speed, the exhilaration of conquest, and when his old horse shows signs of revival he will without doubt flay him as unmercifully as he has ever done in the past, but the fact that he has paused, has wiped the sweat from off his brow so that he can better see the perilous road that lies before him, and is for the time being disposed to tolerate the slow amble of "old biddy," proves that there is conciliation in the air. Hope arises that with each pause in their progress will the driver and "old biddy" view each other less as tyrant and beast. It is not vain to hope that in time both will be so intent upon a correct progress to their destination that there will be no flayer nor flayed, with a respect born of a similar ambition, to guide them.

The Pacific conference marks just one of the world's pauses in its hectic rush towards its destiny. The great powers of the world have agreed to assemble at Washington on armistice day, November the eleventh, at the invitation of the government of the United States of America, all ready and willing to seek a means whereby "old biddy" may be relieved of a part of her excessive burden. No doubt it is their own good which stimulates their spirit of conciliation, but what of it? Shanghai was not built in a week, and it must not be expected that altruism can assert its influence when the driver of "old biddy" has only just emerged



from an orgy of passion so wild as to have well nigh killed them both. And his nether eye still glares, for are not the Jobs of the world already visualizing the failure of the conference, and have there not been little efforts to safeguard against losing what has been gained in the long drive of the past? But the glare is not too withering, the Jobs not too convincing and the little efforts not too spirited, that the world need expect any adverse result from their influence, in fact there is this very promising haze of conciliation enveloping everything, that optimism, tempered with a certain reserve and tolerance, may be indulged in with safety.

C. L.

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## Manchurian Steel Works

**A**LTHOUGH the report of the American mining engineers who recently inspected the Manchurian coal and iron fields has not been made public, it is learned that as a result of their investigation, the South Manchuria Railway Company will proceed with their original plan of erecting the largest steel works in the Orient. The scheme as reported contemplates a consolidation of the Anshan Iron Mines and Steel Works operated by the South Manchuria Railway Company with the Penchiu Colliery and Steel Works, a Sino-Japanese enterprise controlled by the Okura interests of Japan. The low-grade iron deposits in Manchuria which have resisted profitable working under existing methods are expected to yield profitable returns by the introduction of a new American process plant. When the party of American metallurgists passed through Seattle on their way out to examine the Manchurian deposits, the statement was made by an official of the South Manchuria Railway, that, if their report was favorable, it would mean the expenditure of over \$110,000,000 in plant and machinery, the bulk of which would be shipped through the port of Seattle. The expenditure of such a huge sum in Manchuria to place in execution the plans for the new industry will have a far-reaching effect on engineering trade in the Orient, as it is expected that the new plant will be able to furnish all the steel products required for the extensions of the South Manchuria Railway system, the Chinese Eastern and Siberian railways, as well as other enterprises in China proper.

The proposed plant will surpass the present Japanese government steel works in output and deprive Hanyang of its lead in China. With the proposed Kailan steel works in North China and similar projects for Kowloon and South China, the contest for the supply of steel to Eastern Asiatic markets, must, in time, simmer down to one between British and Japanese interests. What effect all this will have on the prospects of other nations supplying China with her railway material requirements, can be best left to the imagination. Japanese enterprise in this connection simply strengthens the position of THE FAR EASTERN REVIEW, in that unless foreign manufacturers are assured a proportionate share of the orders for materials used in the construction of Chinese railways financed by the consortium, it may be exceedingly difficult for the latter to function along the lines originally designed for its operation, without creating friction that will seriously impair its usefulness.

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## China's Guardian

**M**R. Guy Morrison Walker, author of a series of articles entitled "Why America must Fight Japan," is, like others of his school, always seeking to create a situation that will force the United States to take over the guardianship of China and fight her battles. The latest suggestion along these lines is contained in a letter dated June 21, directed by Mr. Walker to President Harding, in which he says:

"There is in the present situation a remarkable opportunity to benefit and aid China and to secure for our own

government some security for the enormous sums that we have advanced to the European powers.

"My suggestion, therefore, is that you have the secretary of the treasury advise the governments of Great Britain, France, Italy, Switzerland, Belgium, Holland and Germany, that he will accept at their present current prices all Chinese government bonds owned and held by them, or their nationals, for credit and payment on account of the sums due by them to the government of the United States.

"By doing this you can make our government almost the sole creditor of the Chinese government, and put us in a position to relieve China from the pulling and hauling of these different powers, and challenge the validity of the so-called loans, which are, in fact, nothing but bribes claimed by the Japanese government.

"I have given the matter considerable thought but do not care to go into detail in connection with it until I learn that your administration is interested sufficiently to give the matter serious consideration."

What a fine thing it would be for the United States to reverse her traditional policy towards foreign investments, and become the preferred creditor of China, and then challenge the validity of loans which at some time or other have been opposed by Chinese political parties as inimical to the national interests? In this category would fall the Reorganization Loan of 1913, which was strenuously protested by the southern party, and employed to large extent by Yuan Shih-kai in suppressing the parliamentary party. If the Chinese should default in the payment of interest or principal on these loans, or the tuchuns confiscate the salt or other revenues allocated for their security, the picture of the American government holding the club over China, when it refused to intervene in Mexico to protect national investments, would add to the gaiety of nations. If protests after protests on the part of the collective powers are unable to deter the tuchuns from appropriating revenues so urgently required for the liquidation of central government obligations, we wonder how the American government single-handed would be able to convince these jolly old free-booters of the error of their ways.

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## The Other Side of Japan's Rule in Korea

**S**IGNS are not wanting to indicate that a reconciliation between Koreans and Japanese is resulting from the liberal policy of Governor-General Saito, and that this much to be desired outcome to recent political misunderstandings, will be accelerated by the economical development of the peninsula under some form of co-operation in which Japanese capital and technical direction will be utilized on a large scale. Whatever hardships the Koreans have endured as a result of Japan's repressive measures against political agitations and revolutionary plots, would seem to have been more than offset by the prosperity brought to the country through the development of agriculture and industries, since the annexation in 1910. Statistics are not always interesting reading, but where they point in unmistakable terms to the benefits of enlightened government they are worthy of more than passing interest. In Korea, especially, they tell a story that should be read in order to appreciate the true inwardness of the other side of Japan's rule in the peninsula. To those acquainted with the old order of things in the Land of the Morning Calm, where the people were the prey of the officials, and it was courting death and torture to possess property or show any outward sign of wealth, the development of the country will come as evidence that the natives are enjoying a material prosperity undreamed of a decade ago.

Remarkable progress has been made not only in the output of manufactured articles but in the ideas of the people towards the necessity of industrial development. The value of industrial products increased from Y.300,000,000 in 1911, to Y.1,760,000,000 in 1919, while trade through the open ports rose from



Y.59,000,000 in 1910 to Y.500,000,000 in 1919. This increase, although partly due to inflated prices of recent years, arose in the main from increased production. The agricultural products of the country valued in 1910 at Y. 240,000,000 increased to a value of Y.1,380,000,000 in 1919 or nearly 600 per cent. This, in itself, is one of the most convincing proofs of the prosperity of the people, yet, notwithstanding the great increase of wealth from this source, new methods of farming, proper selection of seeds, extension of irrigation systems and reclamation of waste lands will more than double the crops in the course of a few years.

The value of forest products increased from Y.19,000,000 in 1910 to Y.30,000,000 in 1919. During this period over 650,000 acres have been planted with trees and a program of reforestation is being carried out which in time will help to restore the former wooded wealth of the peninsula, of whose total area at least seventy per cent. is available for reforestation. One of the most remarkable increases is seen in the development of the fishing industry valued in 1910 at Y.6,000,000 and which in 1919, rose to Y.71,000,000. Surrounded on three sides by seas abounding in fish, the application of more modern and efficient methods of catching and curing will bring still larger returns to the country. In mineral deposits, Korea is specially favored and the output of gold, iron and graphite, although worked on a very limited scale increased in value from Y.6,000,000 in 1910 to Y.25,000,000 in 1919.

In manufactured goods the same steady healthy growth is seen, increasing in value from Y.30,000,000 in 1910 to Y.260,000,000 in 1919, yet notwithstanding this satisfactory development a huge amount of manufactured goods are imported annually from Japan and elsewhere. In finance, traffic and transportation, great strides have been registered, but a still greater program is necessary to meet the constantly changing conditions.

In order to meet these conditions and draft a comprehensive industrial policy for Korea that will promote its economic welfare and benefit the people and at the same time advance the interests of Japan, a committee was recently organized to discuss the situation. As a result of these sessions a general policy of co-operation and co-ordination has been drawn up which provides that the industrial expansion of the peninsula should harmonize with the industrial policy of the empire. The keynote of such development is to be Japanese money and guidance working in harmony with Koreans, and if the latter enter into the program in the right spirit, the figures for the past ten years indicates that an era of unprecedented prosperity awaits them.

The economic situation in the peninsula during the past year, like other parts of the Far East, was one of profound depression calling for the exercise of the greatest care and precaution on the part of the banks in dealing with it successfully. In his semi-annual report for the period ending June 31, the governor of the Bank of Chosen says that rice, the most important staple, yielded in 1920, 14,800,000 *koku*, an increase of a little more than 17 per cent. on the production of the previous year. The cotton crop amounted to 98,000,000 *kin*, a substantial increase over the previous year. Prices, however, were lower, consequently its export underwent a great reduction compared with that of previous years. This produced an impoverishing effect on the agricultural classes but was offset by the transactions in barley, wheat and beans. Mining was anything but satisfactory, but has begun to show signs of recovery, especially with the gold mines which, thanks to the considerable reduction in the cost of production, have substantially increased their output, the export of which, in consequence, witnessed an increase of one million yen as compared with the corresponding half of last year. Fishing never showed such prosperity as it did at one time during last year, the low price of fish as well as the small catch of *mintai* (a kind of fish extensively used in Chosen) accounting for it.

Under such conditions, commercial transactions have been confined to those in pressing demand. The stocks of cotton and sundry other goods laid in speculatively by merchants during the period of great prosperity have, however, nearly been disposed of in one way or another to the great relief of those concerned—

a fact highly gratifying from a financial standpoint. The exports during the half-year ending June 31, 1921, amounted to Y.96,360,000 and imports to Y.103,630,000, a total of Y.199,990,000, and compared with those for the corresponding half of last year, a shrinkage of 10 per cent. in exports and of 28 per cent. in imports. The principal articles of export in which reduction was witnessed were rice, cotton, fish and cattle, while those showing an increase were wheat, ginseng, cocoons, fertilizers and gold, their increase, however, falling far short of offsetting the decrease above mentioned. Of imports, those showing the greatest reduction were millet, wheat flour, kerosene oil, cotton piece-goods and coal.

The investment of fresh capital in industrial undertakings was naturally very small, the capital issued for the formation of new companies or for the extension of existing ones amounting to Y.32,340,000 or only 15 per cent. of the amount for the corresponding half of last year, while, on the other hand, a reduction of no less than Y.5,220,000 was made in the existing amount through liquidation of, or reduction in, the capital of 13 companies. An encouraging, as well as natural, tendency in this connection is that the direction of investment began to turn from mining, navigation and commercial enterprises of a more or less speculative kind induced by the war boom to the more sober ones of agriculture, fishing and manufacture. The light-railway companies, organized in many places during previous years, and the speedy completion of whose projected lines was earnestly hoped for, were involved more or less in the trouble consequent upon the continued badness of the times. Amalgamation between some of them is now under discussion.

Plans are on foot regarding irrigation and other lines. Much light is thrown on this matter by examination of the long term loans so far advanced for the benefit of agriculture and industry by the principal institutions. Up to 1913 the total of such loans advanced by the Chosen Industrial Bank, the banking department of the Oriental Development Company, and the local agricultural associations, all told, did not quite reach 10 million yen. In 1918 it was 30 million yen, and in 1920 over 100 million yen while at the close of May, this year, it reached 123 million yen, or four times as much as it was at the end of 1918. A comparison of these agricultural and industrial funds with the commercial ones advanced by various commercial banks in the peninsula will show that, up to 1918, the former scarcely reached 30 per cent. of the latter whereas in 1920 it reached 70 per cent. and at the close of May, this year, no less than 87 per cent. From this it may easily be imagined how rapid and unceasing was the industrial progress.

Before concluding his description of the economic situation of Chosen, Governor Minobe felt constrained to say a few words with regard to his belief that a key-note of the much-talked-of Japanese-Korean reconciliation must be sought in the economic development of the peninsula. It is hardly necessary, he says, to point out that such development will not only increase the well-being of both Koreans and Japanese residing in the peninsula, but will bring about a closer relationship between the two peoples, while adding, at the same time, much to the economic resources of the nation as a whole. For such development, however, industry in general must be encouraged side by side with agriculture, for which purpose Japanese capital must be invited on a large scale. With capital, he would also like to see many Japanese come to Korea, and, settling down in the interior and commingling with the natives, engage in their trade in co-operation as far as possible with the latter. It is then, he believes, that true harmony will come to all.

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## American Policy in China

### The Evolution of the Hay Doctrine

NOT since William H. Taft delivered his speech before the American association in Shanghai in October, 1906 have Americans listened to such a forceful exposition of their national policy towards China as was expressed by Minister Schurman before the



American association of North China at a dinner given in his honor at Peking on September 9th. Listening to the words of Dr. Schurman the fact was borne home that President Harding has been exceptionally fortunate in his selection of men to fill the highest posts under the new administration, and that if the new American representative in Peking faithfully reflected his views, the next few years will witness some startling changes in Far Eastern politics. Dr. Schurman forcibly emphasized the determination of the American government to maintain the principle of the "open door," and, like Mr. Taft, assured his hearers, in effect, that any infraction of this principle would be viewed by the American government with grave concern. In other words, Dr. Schurman reiterated a policy, which, up to the present time, has been most difficult to apply in practice, and which must now take the form of international co-operation in some form or other, if it is to work out successfully.

Dr. Schurman's speeches since he arrived in China all tend to strengthen the idea that the Harding administration places an interpretation on the Hay doctrine, which for all practical purposes, places China in a class by herself, a country to be maintained intact, come what may, until such time as her people are able to stand alone and take their proper place in the family of nations. In effect, China is the ward of the powers, and if by any mischance, her people are unable to organize a stable government that will carry out its domestic and international obligations, the powers, under the terms of the Hay doctrine, will take united action at Peking "to promote administrative reforms needed for the strengthening of the government and the maintenance of the nation's integrity." This, Dr. Schurman assures us was the conclusion of the American policy of 1899. "If the Chinese government without aid from the outside could not or would not save China, then the great powers in common would be compelled to take 'united action' to aid in saving her. With an anarchic or impotent China before them the powers could not pass by on the other side. That was too vast a menace, not only to their interests, but to the peace of the world."

Like the Monroe doctrine, the Hay policy is passing through a process of evolution and new interpretations found for it to meet changing conditions, with the difference, that whereas the former is essentially American, the latter is becoming more and more international, supported by what may be termed a Far Eastern league of nations. What was once largely a commercial doctrine designed to protect American trade and maintain the principle of equal opportunity has evolved into an open declaration of international co-operation not only in the execution of large financial and development schemes but for bolstering up and preserving a government brought to a chaotic state by the incompetency and greed of their own officials. The new interpretation of the Hay doctrine heralds in no uncertain voice the advent of international intervention into the affairs of China under given conditions, and opens up a question fraught with grave consequences. For no matter how disinterested and altruistic the reasons underlying the necessity for such intervention, it may be taken for granted, that a large majority of the Chinese people will vigorously oppose it and place all obstacles in the way of its success. There is reason to believe that other powers might feel reluctant to endorse such a program.

However, as Dr. Schurman clearly emphasizes, such a radical expression of America's aggressive friendliness for China could only become operative after a complete failure on the part of the Chinese to bring order out of chaos and thus solve the problems of the Orient. "Let China develop a government worthy of comparison with the best in the world and she will then have good ground for expecting foreign nations to withdraw the restrictions they now impose upon her sovereignty. The best hope of China is in herself. She must create her own renaissance." Dr. Schurman furthermore expressed great confidence in the ability of China to solve her own problems, but "if the fears of the pessimists should

be realized, and China should fail to abolish civil strife and develop a stable and effective government acceptable to her own people as well as to foreign nations, it would be a disaster not only for China but also for other nations and a menace to the peace of the world." The remedy for such a state of affairs, is, as he pointed out, international intervention, a drastic step on the part of the powers, made necessary not only to protect China but preserve international peace.

Dr. Schurman emphasized, and rightly, that a China with sovereignty unimpaired and territory unabridged is the first (but not the sole) fundamental condition of all right international relationships in the Orient and of the permanent peace of the world, but he hastened to add, that the principle of the inviolability of national personality while demanding respect and regard from other nations, imposes grave obligations upon the nation which enjoys its benefits. In other words, a nation which refuses to shoulder its share of the responsibilities for world peace, or whose weakness and disorganization is a constant menace to the security of its neighbors, must expect to see its sovereignty impaired by others whose vital interests are jeopardized.

Dr. Schurman's speech while breathing unwavering friendship and sympathy for the great masses of China, must compel the rulers of the country to pause and ponder seriously the full import of his message. If his words mean anything at all, they mean that sentimental diplomacy, as far as China is concerned, has reached its end, and from now on the American government, keenly alive to the realities of the situation, is determined to pursue a more practical policy. It means, as far as possible, that the United States is determined to maintain and preserve peace in the Pacific, and refuses to be railroaded into hostilities with Japan on a wave of sentimental propaganda.

\* \* \*

## "Subtle Discrimination"

"The just and considerate policy of America towards China must not, however, be construed as indicative of any indifference to our rights. What is our due, whether small or great, that we must have. It would be intolerable if others were favored at the expense of the American government, or American citizens. That would be a violation of the principle of the 'open door' and our well established treaty rights. In matters of trade, commerce and finance while we welcome friendly competition we insist that no especial advantages be granted to our detriment. American business in China is entitled to the same treatment as the business of any other power. We demand common and equal trade conditions and common and equal accessibility to markets.

"I confess that there is great difficulty in dealing with some kinds of discrimination; when it is open it is easy to apply the remedy, but it has been practiced in subtle and underhand ways, which it is difficult to bring to light and still more difficult to prevent. That is a form of discrimination against American business which has been much resented and has given rise to much ill-feeling, not only among American business men in China but also among wider commercial circles in the United States. All I can say at present is that in this as in many other matters eternal vigilance is the price of safety, and I can assure business men that they may count on the constant and vigorous support and co-operation of the legation in dealing with this evil. You will, of course, bear in mind the difficulties which in the present condition of China the legation will have to contend with in dealing with these matters. What I promise you is that we shall do our best. We are deeply sensible of the importance of maintaining your rights."

THERE is in the part of Dr. Schurman's speech, quoted above, a reiteration of charges of discrimination against American trade by methods so subtle that it is difficult to produce proofs. The same words were employed by the secretary of commerce in an official letter directed to the chairman of the United States



shipping board in denouncing the port of Kobe. We have heard the same phrase used to explain the reasons why American firms could not operate in Manchuria and Shantung in direct competition with Japanese. The answer to the accusation that the archives of the American consulate in Tsingtau were filled with the evidence of Japanese underhand methods in discriminating against American trade, was fully set forth in the February number of *THE FAR EASTERN REVIEW*. There was no discrimination, no record of any such practices in the archives of the American consulate at Tsingtau. On the contrary, official testimony, clear and unmistakable, proved that the Japanese authorities had placed no impediment in the way of American trade at that port.

Investigations in Manchuria also fail to produce evidence of discrimination against American traders. Americans have had a hard time to establish themselves in Manchuria, and invariably have laid their failure to underhand methods on the part of the Japanese controlled railway. In the same manner, American engineering firms who flocked into China last year and failed to make good, laid the blame on the British, who, they declared, had almost a monopoly in supplying the Chinese with engineering materials and supplies. In both cases, the fundamental trouble with the American trader lay in the fact that he was doing his best to force his way on a basis of equal opportunity into markets that had been created by the loans of other powers. As far as Manchuria is concerned, American manufacturers have derived the major benefits from Japanese exploitation of its resources, but the orders for materials have either been placed direct or through the agency of Japanese firms. Had the Japanese placed these huge orders through American firms in China, the world would have heard less about discrimination.

As it is, this "subtle discrimination" is reduced on analysis to charges that the management of the South Manchuria Railway gives preferential treatment to its own nationals. There is no actual proof of such practices, but every foreigner who fails to make good in Manchuria is firmly convinced that he has been double crossed in some way or other by the railway. One hears second-hand stories of how this or that foreign firm lost out in some way or other through having to pay a higher freight rate than his Japanese competitor, but it is impossible to run these stories to earth, or ascertain the name of the foreign firm alleged to have been discriminated against. It is all very mysterious, and has given rise to the use of the phrase "so subtle that no proof is obtainable."

If pressed for proof, the investigator's attention is invited to the fact that few American firms are established in Dairen or Manchuria, and their absence must therefore be accepted as tangible evidence that they cannot exist because of this "subtle discrimination." In other words, if Americans are unable to compete with Japan in Manchuria, it must be because of underhand practices.

At a dinner recently tendered to the new president of the South Manchuria Railway on the occasion of the visit to Mukden, the American Consul-General, Mr. Pontius, was one of the speakers. He touched upon the matter of complaints and suggested that the railway company appoint special agents at the various large commercial centres who understood English and could act at once in the settlement of claims. The idea was immediately approved by the new administration, and special agents with full powers to adjust differences are to be assigned to Mukden, Newchwang, Antung and Changchun. The special agent for Mukden will be Mr. Go, a trained diplomat, who speaks English and French.

It will be seen from this, that the South Manchuria Railway authorities are also determined on their part to practice constant vigilance in dealing with matters which might be construed as subtle discrimination against foreign trade. It is a direct answer to the implied charges against the line, an open willingness to co-operate with Americans for the suppression of alleged practices indulged in by subordinate employees to annoy or discriminate against shippers other than Japanese.

## The Yellow River Bridge Scandal

ON many occasions we have invited attention to the difficulties surrounding the practical working out of a construction policy for the development of Chinese railways by international co-operation, and maintained that harmony begins and ends with the floating of the loan. When the engineer steps in, friction and jealousies arising out of the method of construction and the awarding of tenders for the supply of materials, are sure to follow. It may be possible for a group of national banks to find a body of engineers representing five different manufacturing nations who can be depended upon to sink their differences and arrive at some harmonious decision concerning the materials to be used in the construction and equipment of such railways; it may also be possible to find a similar group of engineers all trained in different schools, who will work together without friction in their actual construction. But human nature being as it is, and with the manufacturers of the five countries behind their engineers clamoring for orders, it is our firm opinion that ideal co-operation is impractical unless provision is made to eliminate these fundamental causes that make for ill-feeling. We have had occasion in the past to stress this point in connection with the practical application of the Hukwang terms, which provided for international competition in the supply of materials, and have urged that some attention be paid to this phase of the problem in devising a practical program for the consortium, in order to assure its continued usefulness.

In support of our stand, comes the lamentable aftermath to the awarding of the tenders for the Yellow River Bridge. It is not our purpose to go into the merits of the case, contenting ourselves with noting that the incident comes to justify our position on the broad basic principle that it is impossible to bring about harmonious international co-operation in any scheme involving the placing of construction contracts of any magnitude.

In effect, the French, Belgian and British members of the Yellow River Bridge commission brought a charge of dishonorable conduct against Dr. J. A. L. Waddell the eminent American bridge specialist on the commission, who immediately gave their letter to the press and courted investigation and publicity. After a reasonable length of time, specific and detailed refutation of the charges were embodied in a letter from Dr. Waddell to the association of Chinese and American engineers, which was also published with the approval of the Chinese minister of communications.

The association from the outset of the controversy supported Dr. Waddell in his differences with his colleagues on the commission.

Dr. Waddell says that although he had entered plans of his own in this competition these were dropped as soon as he was appointed a member of the commission by the Chinese government. He asserts that his colleagues favored the selection of a plan that would cost \$1,500,000 more than is necessary and would not be the best bridge possible.

In this controversy the fact cannot be overlooked that it was Belgian and French money which built the Peking-Hankow railway, and the subsequent redemption loan, made without provisions for the purchase of materials, was furnished by British, French and Belgian capital. Any international board of engineers, on which these three countries are represented, in the very nature of things, will present a decision favoring the tender of a manufacturer of one of these countries.

This does not imply that any injustice would be meted out to an American bidder, if his price was actually the lowest, but it does mean that everything else being equal, that award would go to one of the three above-named nations, with preference to French or Belgian manufacturers. It was a mistake on the part of the Chinese government to invite an international commission to



decide upon the design and to award a contract of such magnitude made possible by a Belgian and French loan. Ideally and ethically they were right, but the aftermath provides one more proof that ideals cannot always be applied in a practical manner.

It is unfortunate that Dr. Waddell provided the opportunity for his conduct to be misunderstood in such an important international competition, and while we can appreciate his sincerity and desire to procure the best bridge design at the lowest cost for China, the fact remains that China invited an international board to judge the designs and award the contract. Dr. Waddell's views must, therefore, give way before the majority. Aside from all other aspects of the deplorable incident, it provides a lesson, which, if taken to heart, will forestall further misunderstandings, by the application of practical methods in the place of sentimental ideas in the construction and equipment of new Chinese railways by international finance.

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## The Future of Shanghai's Harbor

WITH the arrival in Shanghai of Major-General W. M. Black, and Mr. P. Ott de Vries, C.E., who have been nominated for membership on the committee of consulting engineers who will advise on Whangpoo river conservancy, the efforts of the Whangpoo conservancy board in its investigations may be said to be well on the way to fruition. When the other members of the commission arrive, conferences will be held to consider and to advise upon the needs and possibilities of Shanghai's harbor.

The investigation to be pursued by the conservancy board includes a technical-economical consideration of all the technical accommodation and terminal (wharf, pier and cargo-handling) facilities of Shanghai and a report on the further harbor development possibilities at Shanghai:—

- (a) With the approaches to and limit of draft in the harbor remaining as at present 28—30-ft.
- (b) For the probable maximum draft of ships on the Pacific.

It was specified in the original program that for the formation of the committee one member should be chosen from amongst leading harbor specialists in the home countries by each of the leading shipping nations (including China) at Shanghai as represented on the Whangpoo conservancy consultative board, the engineer-in-chief of the board to be an *ex-officio* member. Nominations have now been made as follows:—

### NOMINATED BY:

### MEMBER:

American Member of the Whangpoo Conservancy Consultative Board.

MAJOR-GENERAL W. M. BLACK: formerly chief of U.S.A. engineers (retired), consulting engineer of the firm of Black, McKenney and Stewart, Washington, M.A.M.SOC.C.E.

By British Member of W.C.C.B.

F. PALMER, C.I.E., M.INST.C.E., consulting engineer of the firm of Rendal, Palmer and Tritton, London. Formerly engineer-in-chief, port of Calcutta, and consulting engineer to the port of London authority of which he was chief engineer 1909-13.

By Chinese Member of the W.C.C.B.

P. G. HORNELL, C.E., M.SWED.SOC.C.E., consulting engineer of the firm of Aktiebolaget Vattenbyggnadsbyran (hydraulic engineering bureau), Stockholm. Consulted by the ports of Gothenburg, Stockholm, etc.

By Dutch Member of the W.C.C.B.

P. OTT DE VRIES, C.E. Until recently head of department of public works, Netherlands India. Now retired.

By French Member of the W.C.C.B.

L. PERRIER, ingénieur en chef du corps des Ponts et Chaussées (Paris). For 20 years engineer on the Suez canal.

By Japanese Member of the W.C.C.B.

ISAMU HIROI, C.E., elected dr. engineer (Tokio), formerly engineer-in-chief Hakodate and Otaru harbor works and professor Tokio University. Consulting engineer to government railways. Member of harbor investigation committee, Tokio. M.A.M.SOC.C.E.

Ex-Officio Member, appointed by the Conservancy Board.

H. VON HEIDENSTAM, C.E., Capt. Royal Swedish Corps of Engineers, M.INST.C.E., M.A.M.SOC.C.E., engineer-in-chief, Whangpoo conservancy board.

The commission is to meet in Shanghai on or about October 15 next and will stay about six weeks.

The task before this commission is of great difficulty as it will have carefully to weigh a number of conflicting technical and economical considerations.

Amongst the principal questions are—

- (1) The possibility of improving the Fairy Flats,
- (2) The alternative question of a Hangchow bay approach, and
- (3) The provision of improved berthing accommodation and general port improvement, even with approaches remaining as at present.

The schemes to be submitted to this committee include a general consideration of all conceivable possibilities, but more especially various suggestions for dredging or training the great Yangtze bar known as the Fairy Flats, designs for a *port de vitesse* on the Hangchow bay as an alternative to an improved Yangtze approach, and lay-outs for first-class wharf accommodation in the Huangpu and elsewhere.

It is also understood that very important and illuminating studies have been made of the economic side of the whole question.

In order to provide proper data for these projects a special department has been organized, surveys have been made on land and water over all the areas involved, hydrological and geological studies have been made, and expert engineers in the home lands have been consulted on detail problems. A series of special reports on data have been issued and the final plans and estimates of the apparently most favorable alternative projects will in a few days be ready for the commission's consideration.

The larger problem has necessarily to be considered from the point of view of the probable draft on the Pacific 30 years from now.

But even if the draft on the Pacific is to remain at 30 feet Shanghai harbor needs improved approach and improved wharfage and berthing accommodation, as well as improvement of its cargo handling.

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## China's Yangtze River War

THE conflict which wages on the shores of the Upper Yangtze River bespeaks of more than the ordinary summer movements that have been the order of things since the abdication of the Manchus. It is impossible to follow in minute detail the machinations which have led to the present imbroglio. At one time the idol of democracy, the saviour of the Chinese people, the popularity of General Wu Pei-fu has fluctuated till not long ago he was denounced as being the betrayer of the masses. And now there



THE SCENE SHIFTERS ON CHINA'S STAGE



Marshal Chang Tso-lin



Dr. Sun Yat-sen



Field-Marshal Tsao Kun



General Wu Pei-fu "The Hope of China"

These four represent groups who are shaping events in China at present time, who are moving the "Knight" and "Horses" till there is compromise or checkmate



grows an increasing regard for him, the factors who would sway public opinion having exposed, through too artless a dissemination of their propaganda, their desire to dethrone or to elevate him as the case might be. Insensible to all this, at least in effect, the general seems to have gone about his business until now he stands at Ichang with the Szechuanese before him representing Southern influence which would force its way to the capital and overthrow present authority if it could. If, as he is reputed to be, General Wu Pei-fu is to be the saviour of the Chinese people, it is evident that this must be according to his own program and not that which Canton may wish to make for him. The Canton government shows signs of having the welfare of the masses (as far as any factor of government in China can have) just as much at heart as does General Wu Pei-fu. Each, it would seem, desires to save the masses from ruthless authority, according to a fashion not laid down by the other. In the struggle between the two, General Wu Pei-fu, the leader on the one hand, and Dr. Sun Yat-sen, the leader on the other hand, the survivor might be left with the welfare of the country unencumbered by any lack of confidence on the part of the people, and if this were all that the war on the Yangtze signified then the onlooker might see more clearly what is transpiring in China at the present time. But there are two names which are linked with the controversy between the North and the South, that of Field-Marshal Tsao Kun and of Marshal Chang Tso-lin, both, it would seem, exercising an influence over the war in the Yangtze which somewhat complicates a normal understanding of the issue at stake.

It will be remembered that Marshal Chang Tso-lin entered Peking some months ago a veritable dictator, asserting his will in all affairs of state, and wielding such power as made of the government a mere puppet show. When he retired to his stronghold in Mukden it was generally conceded that while Peking to all intents and purposes guided the affairs of state the marshal was really the power behind the scenes. His conferences in Peking with Field-Marshal Tsao Kun, in which it would appear that a compromise was effected, succeeded in curbing Wu Pei-fu whose actions at the time threatened the authority of Peking. It was this attitude of General Wu Pei-fu which first called up the cry that he was to be the saviour of the people. As Tsao Kun's subordinate, the trend of events following upon Marshal Chang Tso-lin's visit to the capital, indicate that Wu Pei-fu decided that the old adage "Discretion is the better part of valour" to be one well worth learning. How far his subjugation went it is difficult to know. Many are of the opinion that he no longer stands for those noble ideals with which he is credited and that he is the tool of the super-tuchun, Marshal Chang Tso-lin. Others contend that he has not been subjugated at all; still others that he is playing his own game, outwardly the sycophant of his seniors but secretly working himself into a position from which he may overthrow all fetters that obstruct a reconstruction of China. If these are correct, and the ideals that the general is said to possess in the way of a truly democratic government, are not mythical, then indeed is he deserving of support as much as is Dr. Sun Yat-sen, from those who would see a settled China, a China in which trade may make its way unretarded by superstition and disrupted provinces, where the traveler may move without fear of molestation, where the river steamer may make its way up and down stream without the menace of sniping and artillery fire from river banks, where a strongly developed individuality would make of the country one over which it could no longer be made the bone of contention, the tooth sharpener of such hungry dogs as do growl on the very brink of catastrophe insensible to the results of conflict. This is the China that the true world wants to see, the China that the sane in the personnel of the great powers of the world would like to help as much as their commercial efforts would themselves benefit. If this is the China that General Wu Pei-fu hopes to build up, that Dr. Sun Yat-sen is trying to make possible, then the struggle on the Yangtze may be viewed with a certain degree of optimism, with a sense of comfort that the "hands off China" policy, non-intervention and the great Hay doctrine of the "Open-door," are all wise institutions, best meeting the needs of a people who

can more fittingly extricate themselves from an almost desperate predicament. But—and in China there is a marked emphasis on the word *but*—this is a peculiar country, and one never knows.

C. L.

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## Dangerous Diplomacy

TOKYO, September 30, "Is it true that Mr. Lansing will act as counselor to the Chinese delegation at the Pacific conference?

Is Mr. Lansing the international legal authority mentioned in Chinese notes and inspired newspaper articles who advised against direct negotiations with Japan over the return of Shantung? Does he and ex-Minister Reinsch work together as counselors of the Chinese government at Washington? Why does your government allow two of its highest diplomatic officials acquainted with all its secret and confidential papers to utilize their knowledge for the benefit of a foreign government? Suppose the Japanese minister to Mexico abruptly resigned from the diplomatic service in order to accept the post of high adviser to the Mexican government at a time when questions of great importance concerning Mexico came up for settlement between America and Japan, what would Americans say? These questions in some form or other, direct or covert, have been thrown at me by nearly every prominent Japanese interviewed since my recent arrival in Japan.

They are hard to answer. It is well known that ex-Minister Reinsch officiates as adviser to the Chinese government at Washington, and news dispatches announce that ex-secretary of state Lansing will advise the Chinese delegation to the Pacific conference. The facts speak for themselves and provide an opportunity for the creation of many misconceptions about American policy in the Orient. Behind these queries lurks the more serious one involved in the propriety of a high diplomatic official of any state utilizing his special knowledge and experience for the benefit of another government in delicate international disputes, without giving rise to the suspicion that his government is an ally of the nation benefitted by this departure from diplomatic etiquette. The Japanese cannot conceive of a diplomatic service whose officials on retirement are permitted to enter the employ of another nation, especially as advisers on international questions affecting the peaceful relations of their own and other countries concerned. The average Japanese who reads in his newspaper that Mr. Lansing and Mr. Reinsch will act as counselors to the Chinese at Washington, associates this with the existence of some understanding between the Chinese and American governments, which for all practical purposes makes the United States an ally of China. They cannot understand that the United States has no permanent diplomatic service, or, that after the expiration of their tenure of office, our diplomats are returned to private life equipped with an intimate knowledge of foreign relations and policies which they are at full liberty to capitalize by acting as counselors to other governments.

Americans must realize that Japanese comments upon our institutions are a factor in the present situation that cannot altogether be brushed aside as of no consequence. If the highest diplomatic officers of the past administration, fully conversant with the secret and confidential reports emanating from Tokyo, Peking and the European capitals, are to guide the Chinese delegates at Washington, it may be difficult to explain that our government is not in full sympathy with China and opposed to Japan. These comments reveal a serious flaw in the American diplomatic machinery, and constitute a forceful argument for the establishment of a permanent diplomatic service, or the passing of a law by congress prohibiting an ex-cabinet officer or diplomat from entering the service of a foreign government or serving them as counsel without express permission from congress. Otherwise, we are creating a precedent subversive of all rules and ethics that underlie diplomatic intercourse, a precedent that some day may be invoked and followed by other powers in a manner we would immediately resent.

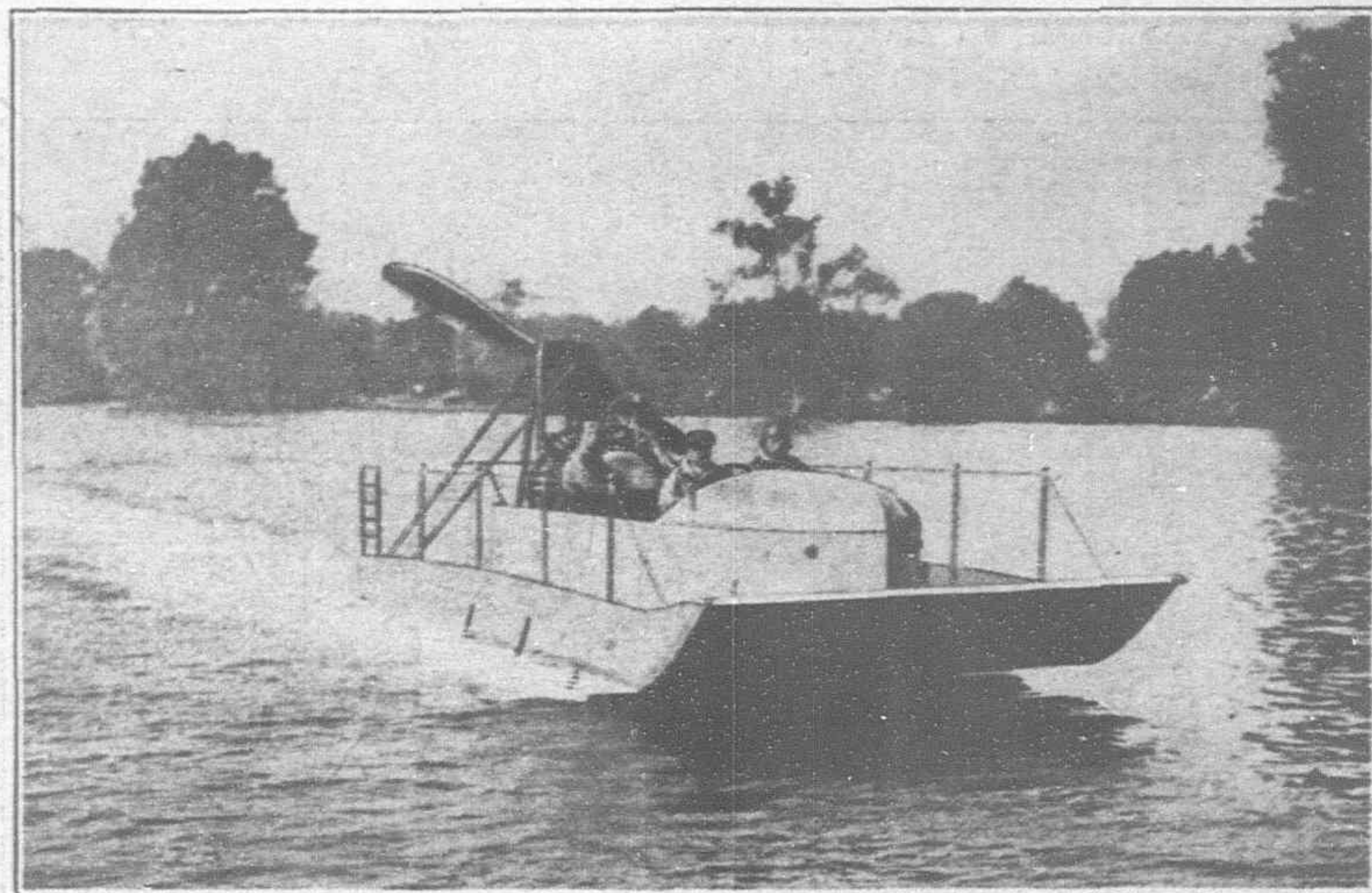
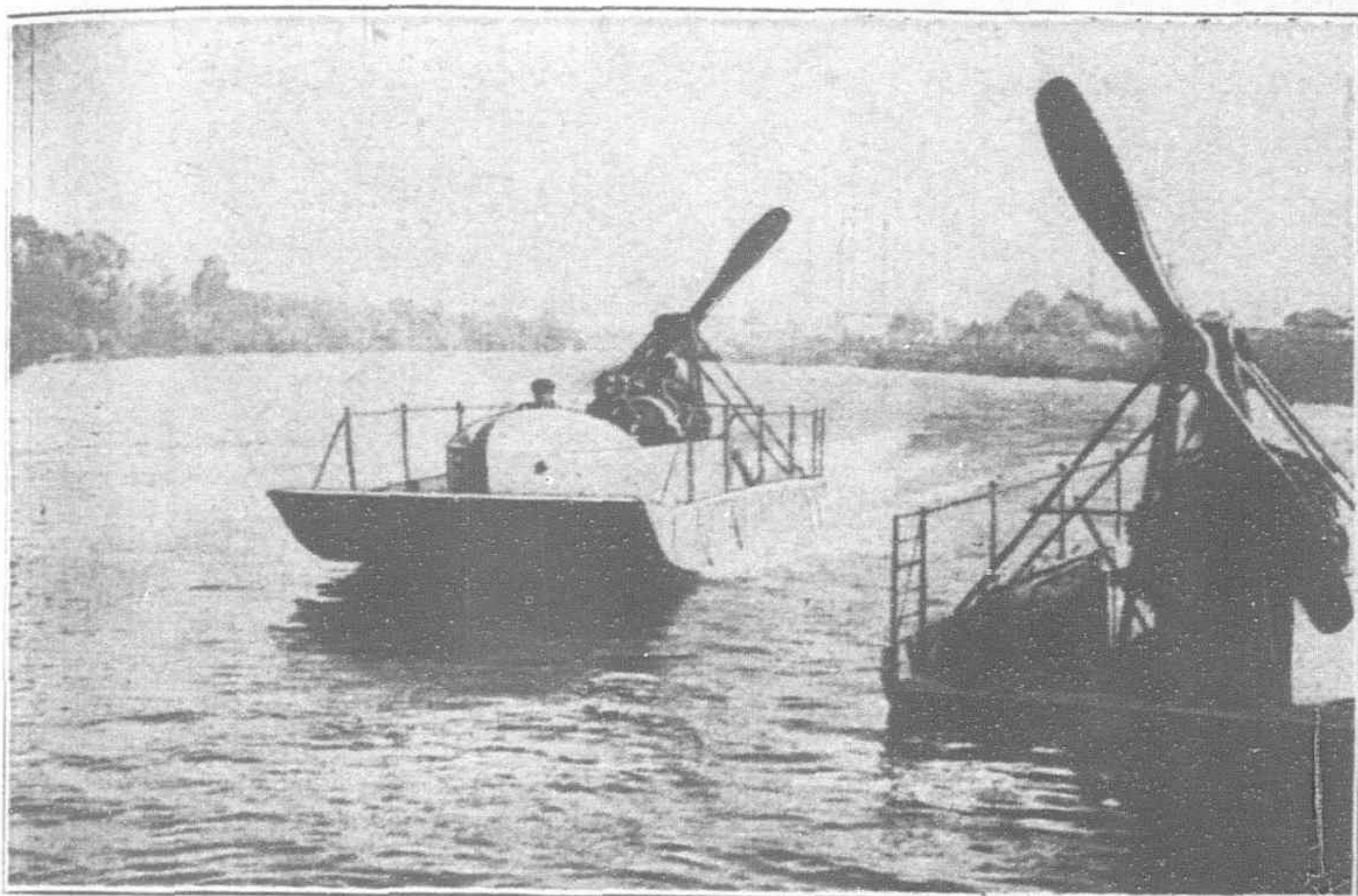


# Hydrosliders in China

**I**N our September number we printed photograph showing a new type of shallow draft boat with air propeller, now in use on the Clyde. It will interest our readers to learn that such boats, known as "Hydrosliders," have also found a market in China, where a certain number of these interesting apparatus are in operation at the present time.

bert, Nanterre (Seine), France, in many sizes, and for different capaciousness and speed. The dimensions most in use range from 5.50 metres by 2.50 m. to 12 m. by 6 m., with a capaciousness from 200 kilos to 4,000 kilos. The speed differs from 55 to 90 km. per hour. As fuel serves benzine.

Amongst others, one of the boats has been sold to the governor at Canton, where it is in permanent use and causes much



By the courtesy of the sole representatives for China for these type "De Lambert" apparatus, the S-te Franco-Chinoise de Constructions Metal-liquies et Mecaniques, Shanghai, we are in the position to show here some views of the boats in use.

The above hydrosliders are built by the well-known firm in Europe, S-te A-me des Hydroglisseurs De Lam-



admiration. Another hydroslider has been purchased by a certain commercial concern for the purpose of carrying on regular trips on the Upper Yangtze between the cities of Ichang and Chungking, and it is further planned to establish regular communication on the shallow rivers in the interior by hydrosliders on a large scale.



## HYDROSLIDERS DE LAMBERT

1. Type XI. running at a speed of 80 km. per hour.
2. Type XI. running at a speed of 90 km. per hour.
3. Hydrosliders de Lambert with Luxury Cabin Limousine.
4. Hydrosliders in Mesopotamia during the War.
5. Hydrosliders for Mail Transport on the Tigris.



# Mining Machinery in China

**I**T is not always that forecasts prove themselves to be accurate, the element of risk, of uncertainty, all over the world attaching to them a weight used only by intrepid speculators. In China forecasts are even more handicapped for here conditions are of so precarious a nature as to guarantee but little security in matters about which forecasts are made. It is, therefore, with a degree of hesitancy that we predict a time when mining in China will have removed from it those fetters which obstruct even a gradual development. There is evidence

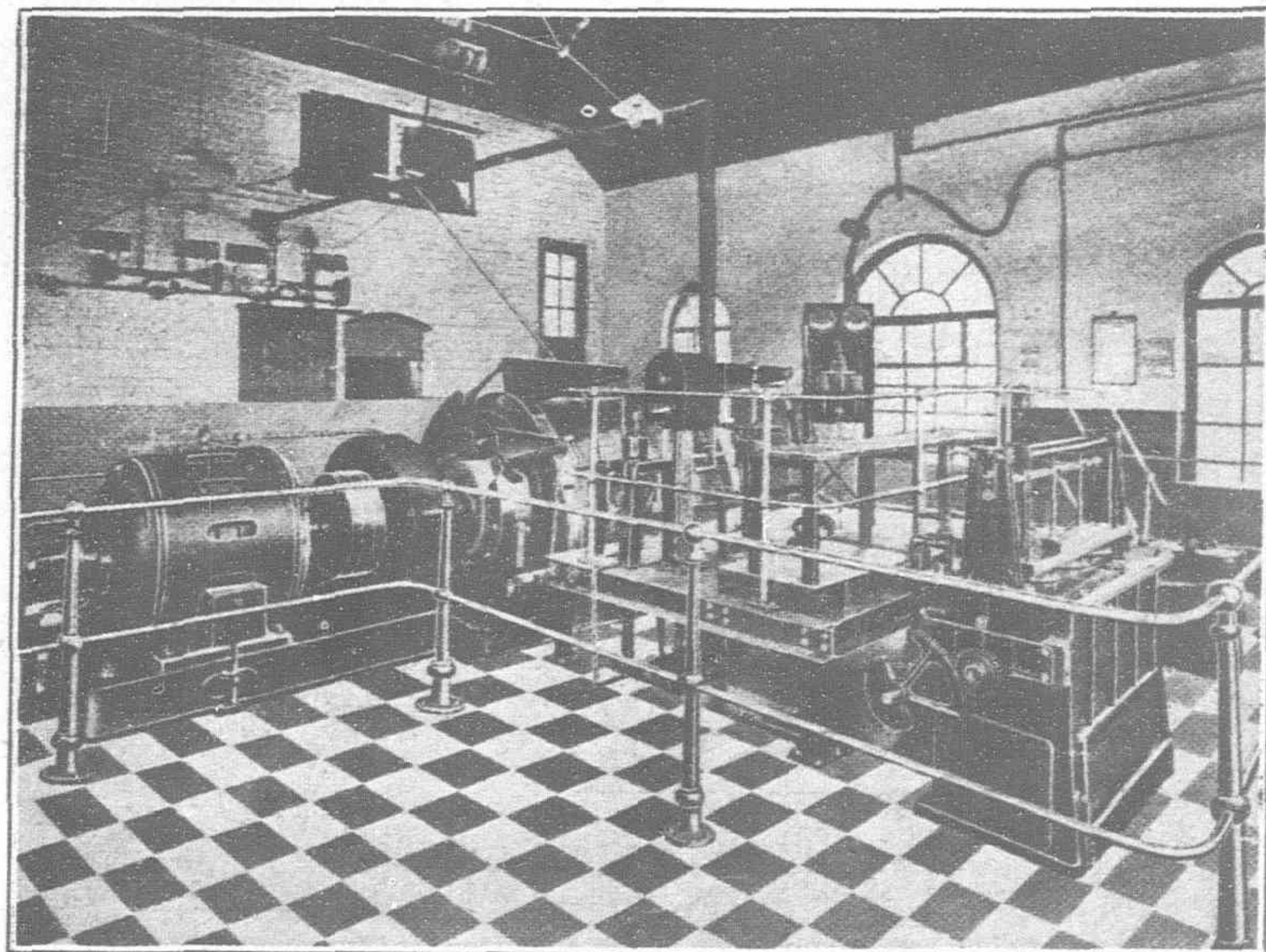
being carefully worked out. The gear wheels are of cast steel and machine cut. The helical pattern of teeth being generally adopted. The brakes are generally of the post type, with brake path on each side of drum. The application is by foot treadle assisted by hand wheel and screw at option of attendant. Further to this, a weighted lever with trip gear operated by an electric solenoid comes into action in case of overspeeding or passing the appointed extremities of the wind. This trip can also be brought into action by the attendant if in his judgement it is necessary. The drum is made cylindrical if required and is either of cast iron sides and centres or built up of steel. According to the requirements Messrs. M. B. Wild & Co., Ltd., make a built-up steel drum of the cylindro spiral type by means of which they can give the greatest efficiency in the balance of the winding operation. Winding indicator, overwind prevention and overspeeding appliances of the most efficient type are included with the machines.

## Haulage Gears

Messrs. M. B. Wild & Co., Ltd., manufacture these haulages from 10 HP. upwards, either with main and tail rope drums or with surge wheels for endless rope gear. In cases of the endless rope they can arrange them up to five surge wheels for five separate haulages on the same machine and operated by the one motor. The clutch gear for each haulage is of the friction band type which can be brought into operation without stopping or interfering with the speed of the motor.

## Friction Winches

These gears have been designed with the idea of giving compactness and lightness, together with strength and durability. With this object in view, tooth gear wheels are dispensed with on the drumshaft and an efficient friction drive is introduced. There are few working parts, and the operation is by one handle, the movement of which from the neutral position in one direction engages the friction pinion for hauling or in the other direction throws the drum on to the brake blocks. The frame is built up of mild steel plates and angles, fitted at the bottom with short pegs to act as guides, so that the machine can be placed on the tram lines and skidded where required as in the case of headings or re-opening of working places. The drum is cast iron in one piece, having gun-metal bushes. The circumference of each side of the drum is V grooved, into which the friction pinions engage. The drive between the friction pinion shaft and power unit (electric motor or oil engine) is in the case of single drum machines by means of straight tooth machine cut gearing, or in the case of the tandem drum by means of chain. The drum is mounted on an eccentric shaft, and is put into gear with the friction pinions by the handle. The reverse movement of the hand lever brings the drum on the brake block which consists of steel angle, lined with friction lining, bolted to the framework.

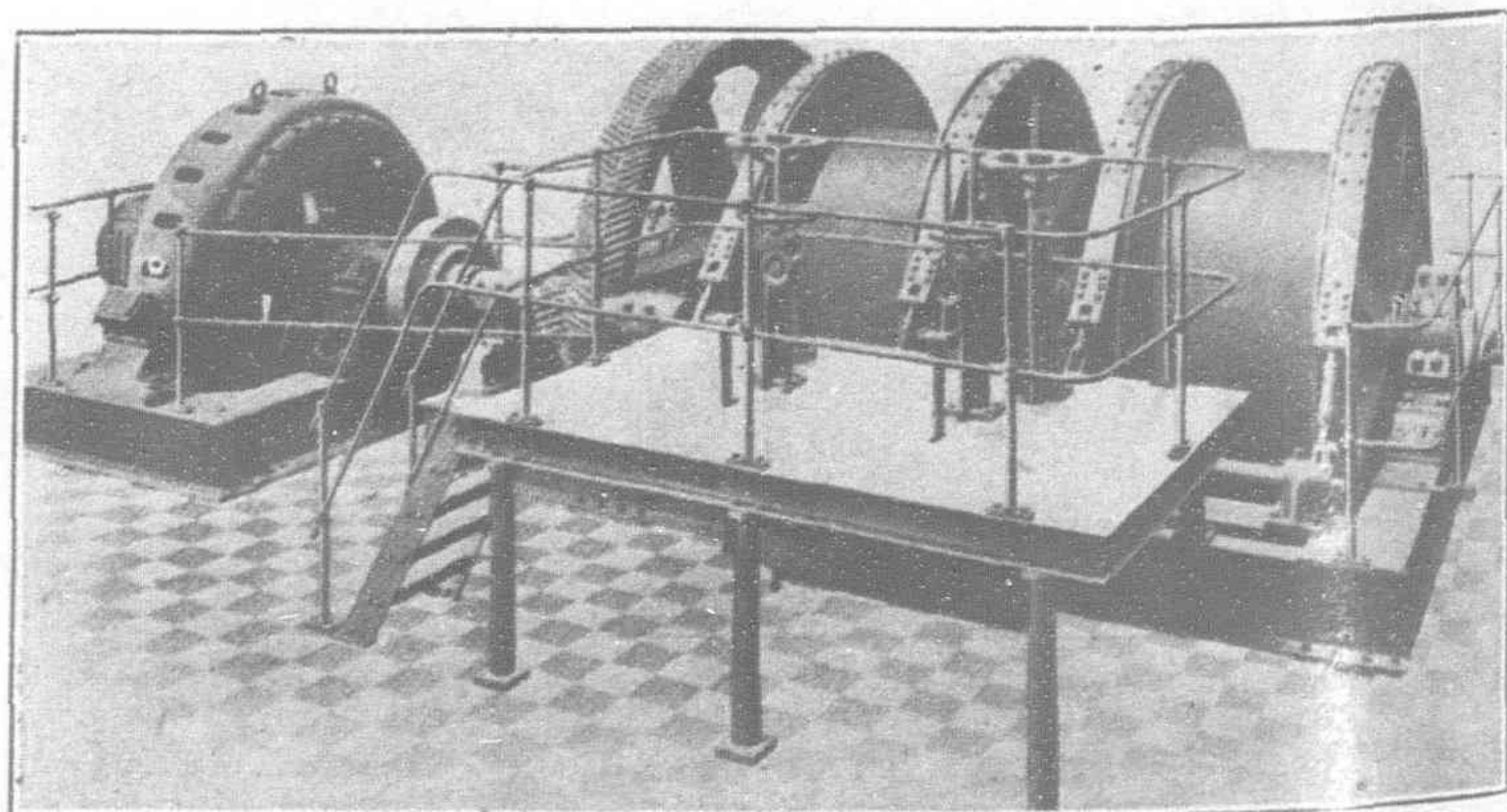


Single Drum Winding Car working at a Colliery in the North of England

to support this contention but there is also evidence to refute it. We claim no greater powers of discernment than others so we feel ourselves to be accompanied in the belief that below the surface there is a barely perceptible undercurrent which will in time clear the obstructions in the shallow and almost stagnant waterway. The advantages of mining development to community and to trader alike have been recognized for many a day past and there has been no diminution in the eagerness with which each promising eventuality has been pursued because of plums that are there for the picking. The fences round the trees are thick and almost impregnable but a steady sawing can be heard and in the course of time a good entry will be made. And the pickin' will be good, so geologists have made bold to prophesy. To dispense with the further use of metaphor there is much ore below the surface scraping of China's mining districts some of which already been reached by the use of modern mining machinery. The difficulties that mining engineers meet with make it imperative that the best of machines be used in their operations. There are many types and makes of mining machinery. A manufacturer of merited prominence is Messrs. M. B. Wild & Co., Ltd., of Nechells, Birmingham, England. This concern manufactures a fine line of winding and hauling machinery besides other machines which it is our pleasure to give details of below.

## Winding Machinery

The motive power of these machines is generally by an electric motor. The bedding is of the self-contained type of cast iron box section, and it is well proportioned for carrying the various stresses of the winding operation. The bedding thereon for the shaft is properly planed and efficiently glutted to prevent lateral moving. The foundations to consist of concrete generally, and the bedding after being fixed is floated up and run solid. The shafts and pedestals are of efficient sizes all transverse and torsional strains



600 H.P. Main and Tail Haulage Gear



# Canton in the Changing

**A** PART from its political aspect there is much of interest in the city of Canton, the stronghold of Dr. Sun Yat-sen and his followers, more especially to those who await with eagerness the embracing of Westernism on the part of the Chinese. The environment of the southern Chinese, or Cantonese, as he is better known, makes of him a type unknown in the frozen North where vitality is more concerned with combating life-killing rigor than it is in the pursuit of adventure. The Cantonese is by nature virile, temperamental and quick to embark on any project that has in it not too much of the element of risk. He seems to possess a strange mixture of shrewdness and carelessness, the former acquired through a long line of thrifty ancestors and the latter through the effect of climate upon the blood, a combination which, in the warring of each propensity against the other, has made of him a sagacious adventurer. Thus it is that the Chinese best known in Europe and America is the Cantonese; thus it is that he is to be found in all the corners of the world, where he thrives without losing any of his Cantonese characteristics, and is able to send back to his homeland dollars upon dollars which maintain, or help to maintain, his clan, and which are the means of building up for him that little corner in the homeland wherein he will be the true lord and master when the time comes for him to return.

It is not surprising then that this man of broadened intelligence has adopted the teachings of the Western world with far less reserve than has his Northern brother. It is true that the industrial development in the ports on the Yangtze River and in a port of two in the Gulf of Pechili has been large but it does not seem to have come without excessive labor and pressure on the part of those introducing it. Perhaps in the past the Cantonese have seemed to embrace modernism to a greater degree than has actually been the case but whether this is so or not the fact remains that the great strides that are being made at the present time in Canton are absolutely unfettered by superstition or any other of those qualities that have made of the Chinese the arch-procrastinator of the world. It is common knowledge now that Canton is being rebuilt. The Chinese themselves have tired of the ancient, most oriental of all cities in the Orient. It has long been famous as a human hive of 2,000,000 people where there was not space for a quarter that many, a hive of narrow, swarming alleys and overhanging houses and indescribable smells and noises and crowds—the most alien sight, perhaps, that a foreigner could find anywhere in the world.

And the Cantonese have started in to make Canton a modern city. To-day there are fine, new streets, 80 to 120 feet wide, cut through the old, swarming alleys and moleburrows. The waterfront has been made one of the handsomest in the world, with big, modern buildings and a parkway three miles long. The city wall has been leveled, and in its place there is a boulevard rivaling

those of Paris. Thousands and thousands of shacks have been swept away. Instead of the little, dingy shops of old, there are great department stores, equal to any in Europe. The open sewer that ran through the heart of the city has been covered with masonry and made into a driveway. On every side are seen the steam roller and the pile driver and the cement mixer.

All this has been done in two years, and the work goes steadily ahead. Millions upon millions are being spent. And the Chinese themselves are furnishing the money. They pay the expense with funds from the sale of lands that became public with the overthrow of the empire, and other public moneys, and with a levy on property-owners whose land is benefitted by the improvements.

The city has a commission form of government, modeled after the American plan. It has forty daily newspapers. It has modern schools, in which all the higher grades are taught English.

And it used to be said that China never changed, and never would!

It is doubtful whether she will—spiritually. Come may the great monuments of industrialism, the cults of Westernism and everything else that the Western world will bring to this land, but our friend the Chinaman will never be anything else but a Chinese. There need never be any doubt about this although an American

newspaper of somewhat jocose propensities made the announcement recently that a Robert West had met a Rebecca East at a factory of some sorts to marry her later, said announcement being intended to gainsay Kipling's famous truth that "Ne'er the twain shall meet."

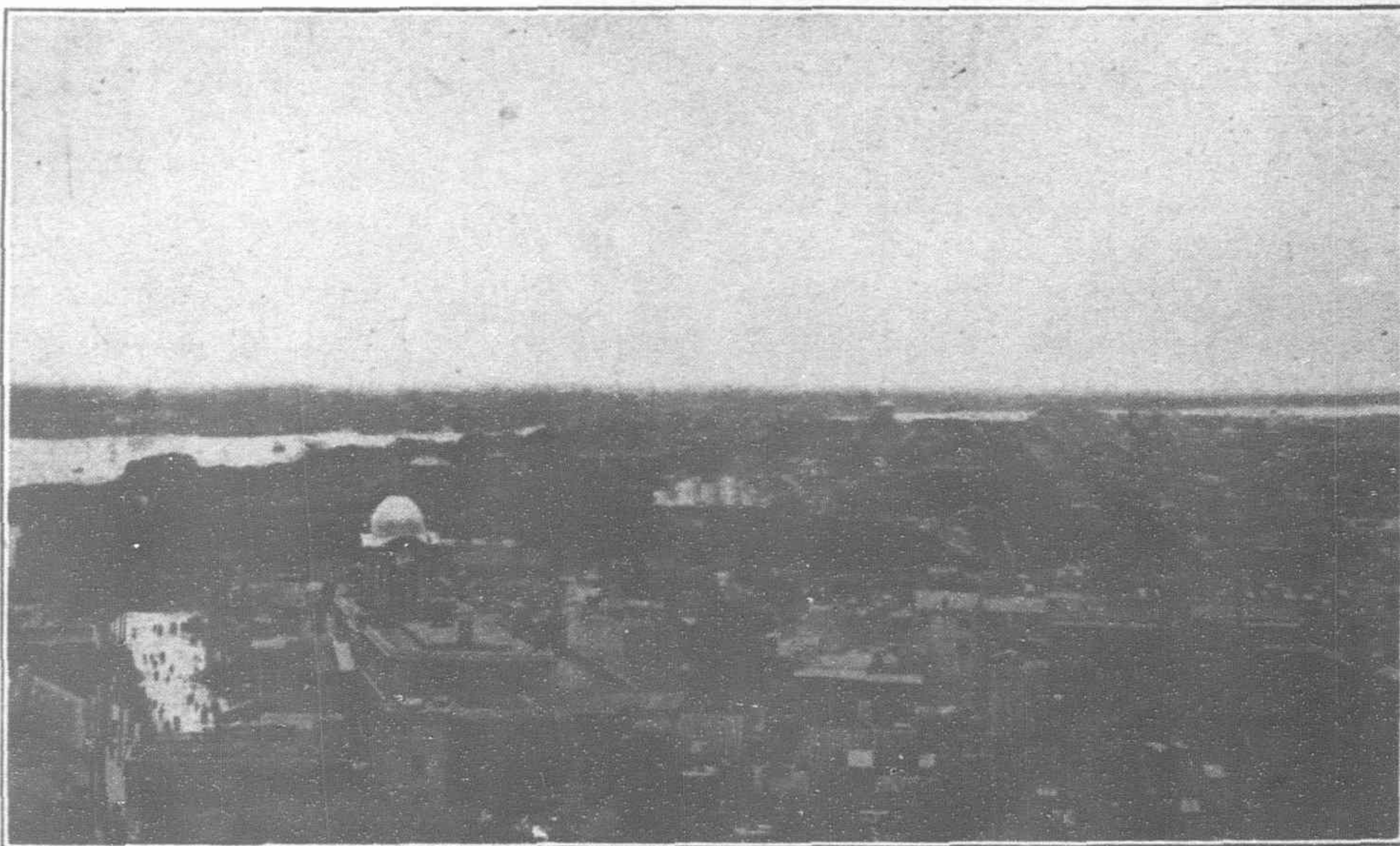
The world has seen Japan imbibe, in but a few short years, so much of Westernism as to make of her a power to be reckoned with in all world affairs. Japan has become an industrial country and as yet

there is no trace of the effect upon her people that the spindle, the steam hammer, the blast furnace, has had upon the peoples of the Western world where materialism reigns supreme. The Japanese are still Japanese and there is no reason to believe that they will be anything else. The Chinese possess characteristics equally impregnable and while China may change in appearance the Chinese never will.

Of the cities, other than the treaty ports or on those tracts of land beside Chinese cities where the foreigner has settled, Canton is changing the most rapidly.

One need only get off the small river boat from Hongkong to see signs of great change in the port. There is something of the atmosphere of a new mining town superimposed on an ancient city.

The city wall has been torn down. Around the labyrinth of narrow lanes that have been the city's only streets for centuries is a belt of newly made broad roads. It is possible now to ride in motor cars as well as sedan-chairs. Inside the city houses and shops are being torn down to make new thoroughfares where the



Canton; the Island of Shameen fronting the River





A clean, broad street in Canton



On the way to the City Yamen

streets have been from eight to twelve feet wide. Old temples are being made over for schools and charitable institutions. Plans are being drawn for river conservancy, land reclamation and a new harbor. True, ambitious and high-sounding plans have been made in China before, and most of these plans under way at Canton are blithely indifferent to the feelings of the mass of the Chinese people, who don't particularly want change, but now, at least in Canton, the plans are being made by men who sincerely want to carry them out and have begun to do so.

It would be interesting to refer in detail to some of the things that have permitted the title of this article, "Canton in the changing." To take the old city wall first:

The most recent sign of progress in Canton is the removal of the city wall, making where the wall formerly stood, a wide road on which before long an electric tramway will be in operation.

The total length of wall is nearly six miles. The wall about the old city had an average height of 24 feet, with a width of 35 feet at the top and 43 feet at the bottom. The wall of the new city was about 15 feet high, 13 feet wide at the top and 17 at the bottom.

The work of removal which involves some 800,000 cubic yards was begun in December 1918 and was under the direction of H. L. Wu, a graduate of the Canton Christian College, who has also studied civil engineering in the United States.

The earth was shipped out mostly by small boats on the various water-ways around the city, while the more useful materials, such as stone and brick were turned over to the municipality by the contractors. Six thousand laborers were engaged on the work, receiving wages at 20, 30 and 50 cents silver per day.

Turning now to buildings, the latest development on the Canton waterfront is the nine-story building of the Tai Sun Company. Besides a full-fledged department store in the American style, the company includes in its new home a modern hotel and roof-garden called "Hotel Asia," which caters to foreign as well as Chinese patrons. The building is of concrete and cost \$700,000, Hongkong currency. From the tower wonderful views of both the city and the harbor of Canton are to be had.

The building to the left of the Great Sun Company—that with the egg-shaped dome on the clock-tower—is the custom house of the port of Canton, where exports of about \$52,000,000 gold and imports of \$30,000,000 are handled annually. Canton was until 1842 the only point of contact between China and the West.

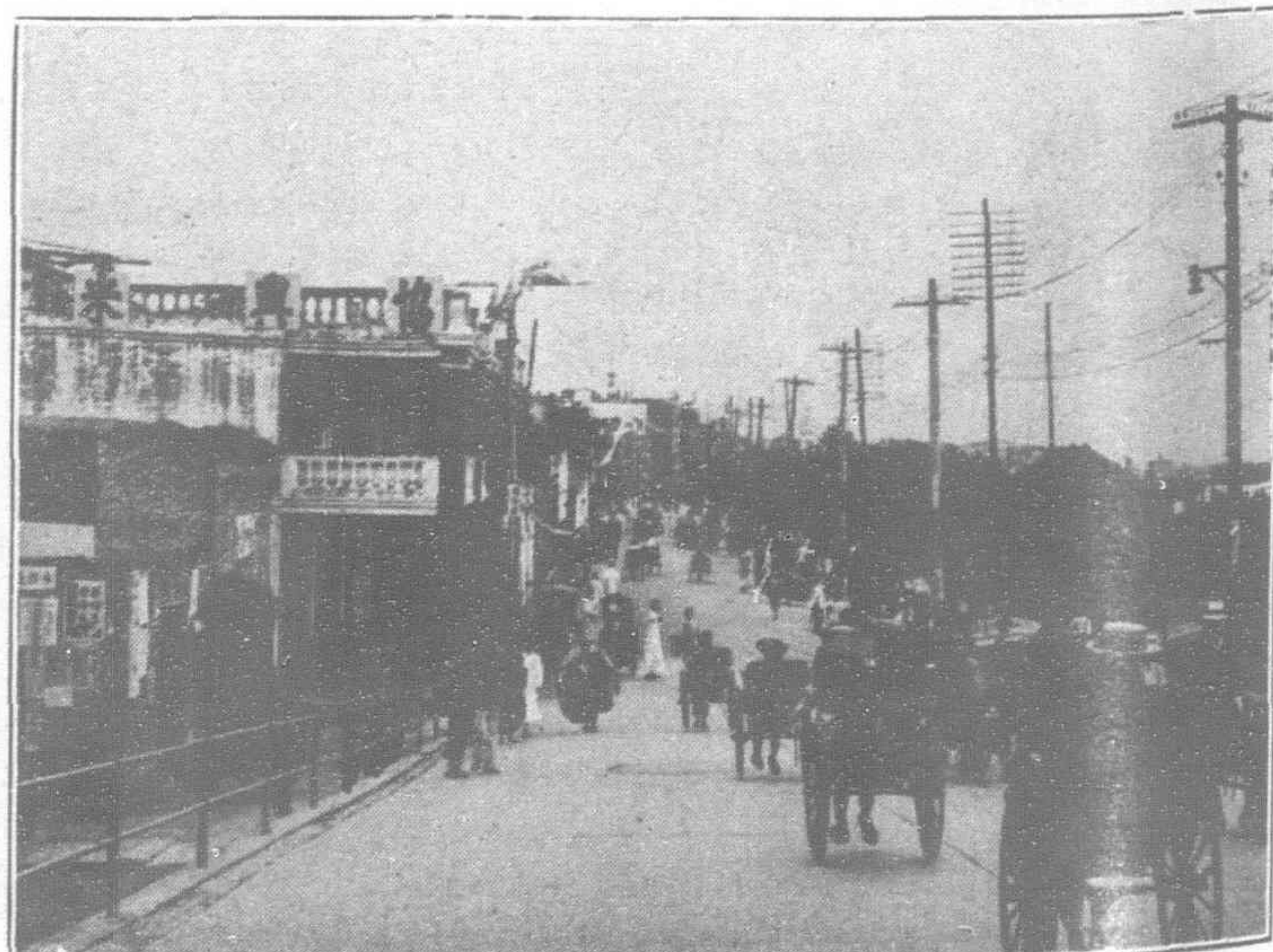
This modern waterfront of Canton extends downstream from the foreign concession of Shameen for some two miles. There are several very striking and really substantial structures, but most of the buildings are a curious combination of Western and Chinese ideas and are not always as carefully built as they should be. This waterfront development is all on filled-in ground, and the whole of it, including the bund-wall itself, all the front buildings and most of the second row as well, has sprung up within the last 15 years.

And now there follows such general information as need not come under any particular heading all of which show in some detail the changes that are being wrought in Canton.

The American commission form of city government is being copied and enforced in Canton, Swatow and other cities of Kwang-



Where once were darkened alleyways



The ancient ricksha moves beside the modern telegraph wires





On the River front at Canton

tung. So far it has been successful, especially along the lines of public health, public education, public works and public utilities. Now physicians and druggists have to register, and all restaurants and food dealing places are subject to inspection by the health authorities. The motor bus and other cars cannot operate without a license and an experienced driver; and hotels, theatres and amusement places have to be morally clean.

Consciousness of their power has not only been felt by the women who have gained the privilege of equal education throughout the province and general suffrage in Canton proper, but also by the laboring class. Through a series of strikes and demands, the laborers in Canton at least have received higher wages for less work; and the municipality of Canton has provided three seats in its advisory council for the laborers with same privilege to merchants, while the teachers, the physicians, the engineers and the lawyers have each only one representative.

Canton city is laying out a track and field on the east parade ground for the athletes of the city, and the baseball players of the Sun Ting Club, composed mostly of returned students from America and Europe, will not have to practise their games daily in front of the "New World," an amusement park recently opened for men, women and children.

Political chaos in Kwangtung has not impeded the progress in industry in the last three years. Kwangtung now has matches for export, and the factories in Tungshan, Yimpo, Honam and Wongsha are providing employment for thousands of women and children. Rubber goods, the printing press, paper card boards are new industries in this province, while weaving, knitting, rattanware manufacturing continue to show growth. Cantonese now has factories that turn out leather, and 1920 found the export of this product an increase of 15,000 piculs over the previous year. The building of modern roads in Canton city the last two years has forced the Government Cement Works in 1920 to produce some 130,000 casks, an increase of 50 per cent. on the working of the previous year.

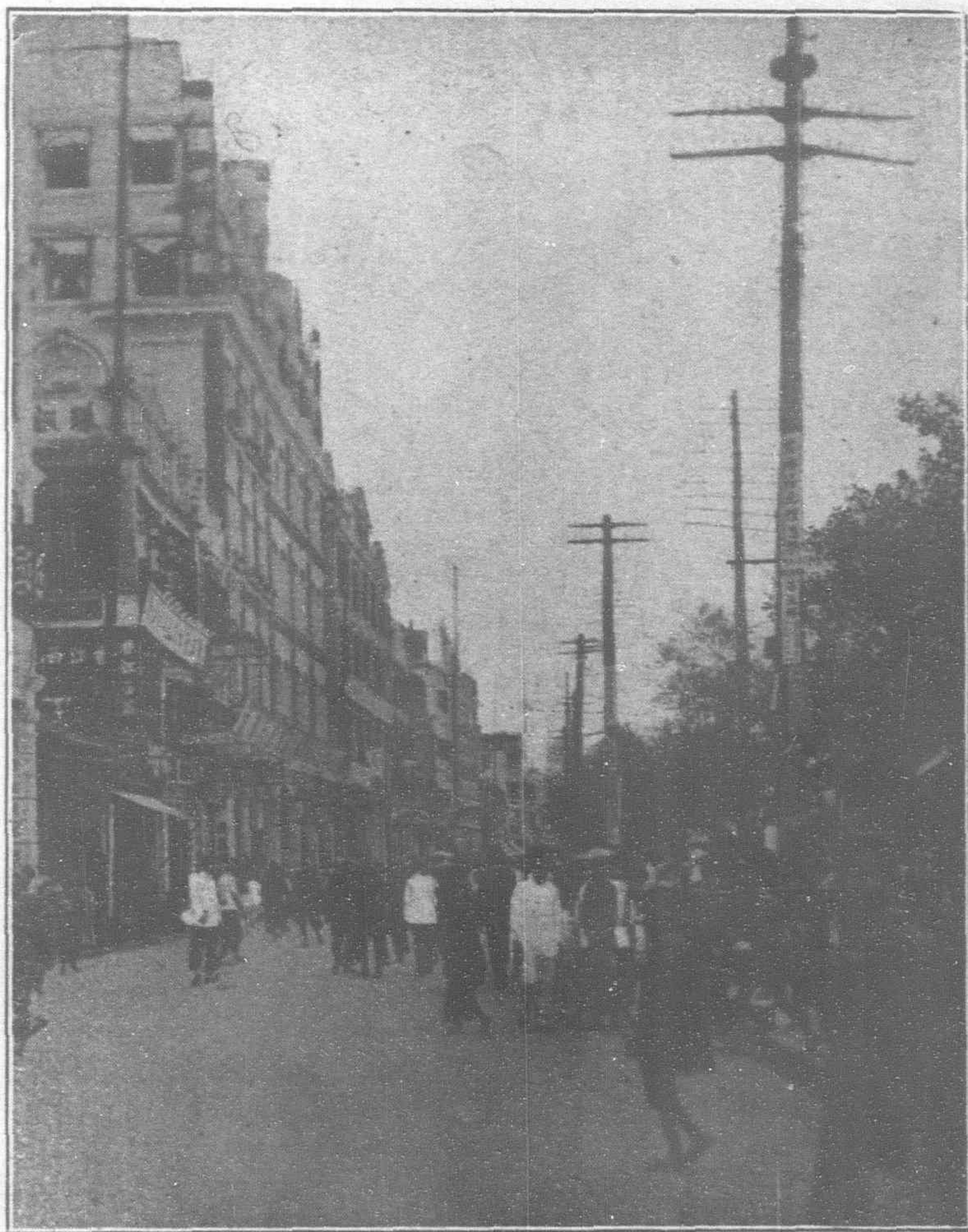
The last year or two saw the formation of stronger fire-insurance companies under native management, and the fear of local disturbance in important cities due to the civil war did not discourage the operation of many agencies. The Chinese Merchants Bank of Hongkong and the Provincial Bank of Kwangtung opened offices in Canton last year, in addition to the Bank of China and the Bank of Canton, making now four Chinese modern banking institutions operating here. The patrons and depositors of these banks are growing rapidly. The Cantonese have just organized a stock exchange. The general chamber of commerce

has organized a department of statistics and will issue trade reports from time to time. The government will grant a lot to this body to erect a modern building for offices. The merchants along the Bund in Canton have ordered modern fire-fighting apparatus, and it will not be long when engines of the latest type will replace the ancient system of water-wheel and buckets.

For the best part of the last three years the grounds of the Canton government agricultural experiment station were occupied by the militarists as a government office compound and the farming experts had to labor in matsheds outside of their old laboratories and testing rooms; but in spite of these obstacles and lack of financial support, many farmers have been taught to raise more than two rice crops a year and plant useful food-stuffs between seasons. The department of forestry which will supervise the reafforestation of many barren hills of Kwangtung has commenced service in some North River districts, while the board of conservancy works has built many dykes along the East River to guard the interests of local shipping and agriculture. In addition to government efforts the Canton Christian

College has opened a course in sericulture, and in addition to instruction to regular students, silk farmers will be invited annually to the college farm to hear lectures and watch demonstrations which will improve their knowledge on this line.

These few details are perhaps sufficient to show that much is being done in Canton along Western lines and in the course of time, it may not be very far off now, we may see a city which, except for its signboards, people and such other inevitable evidences of China, will have the material appearance of a modern American or European city.



An Imposing Array of Buildings, Canton



# Philippine Water Supply Systems

**A**MERICAN rule has brought many benefits and blessings to the Philippines. It is safe to say, however, that the much advertised political progress of the islands is not to be compared to other improvements touching more intimately upon the life and health of the people, the most important of which has been the gift of pure drinking water through the sinking of countless artesian wells. In the past, many of the cholera epidemics which periodically swept the islands and took heavy toll in human lives, had their origin in a germ-laden water supply. Probably the most severe visitation of this terrible scourge had its origin in a broken

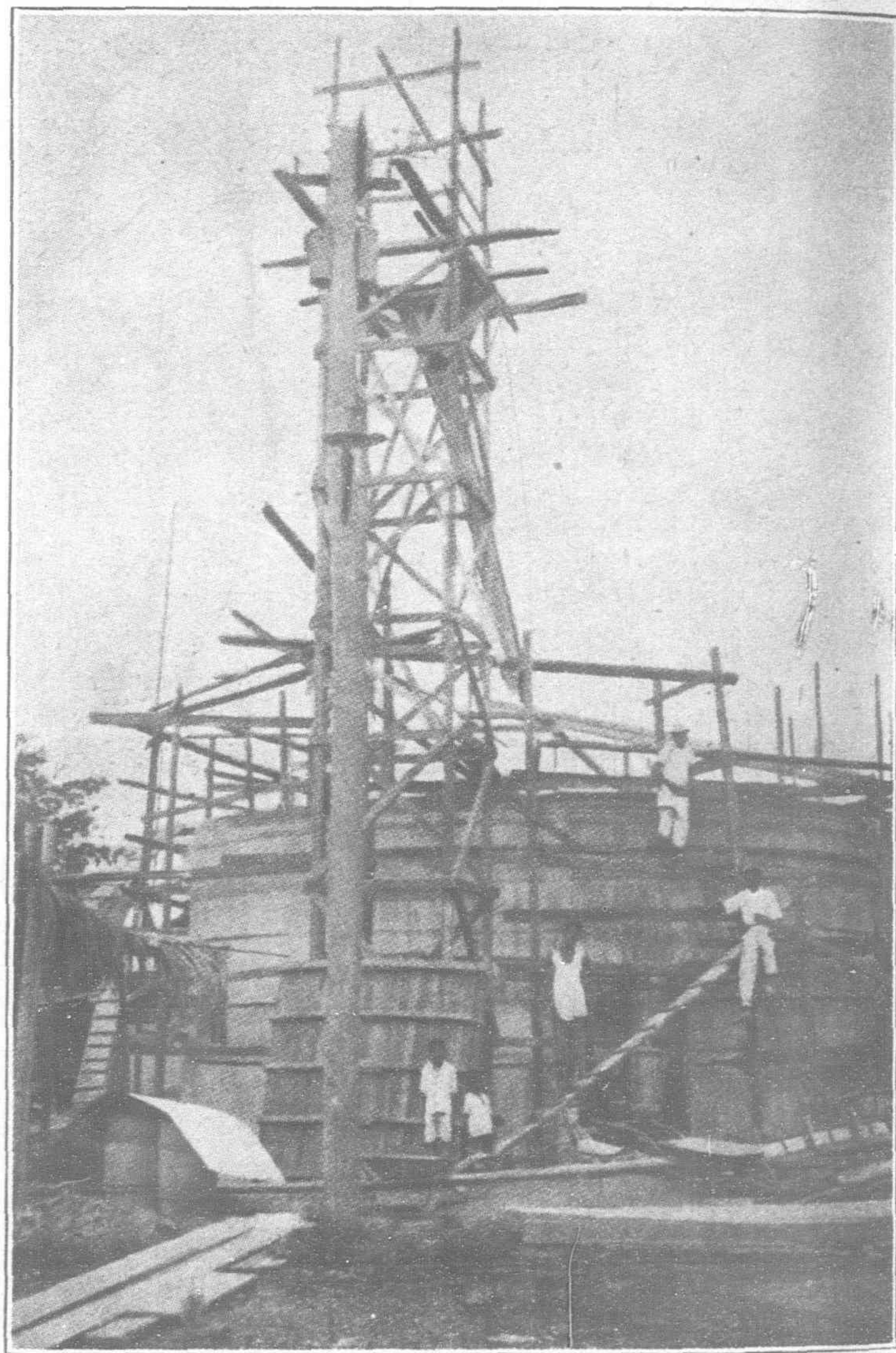
be the sewage water oozing and bubbling up from a bursted drain pipe buried several feet below the sands. Such a thing could not happen again in the Philippines where the natives have been educated to take precautions against impure water, and to rely on the "village pump" or the artesian well supply.

The vital statistics of the islands indicate the effect that this has had on the mortality.

The latest census of December 31, 1918, gives a comparison of mortality in the Philippines in 1903 and 1918 and the figures give an idea of the sanitary conditions in certain localities of the islands, due to a great extent to the establishment of artesian



Pipe line, Nagcarian Waterworks, Laguna, P.I.



Santa Cruz Waterworks. Tank under construction, Laguna, P.I.

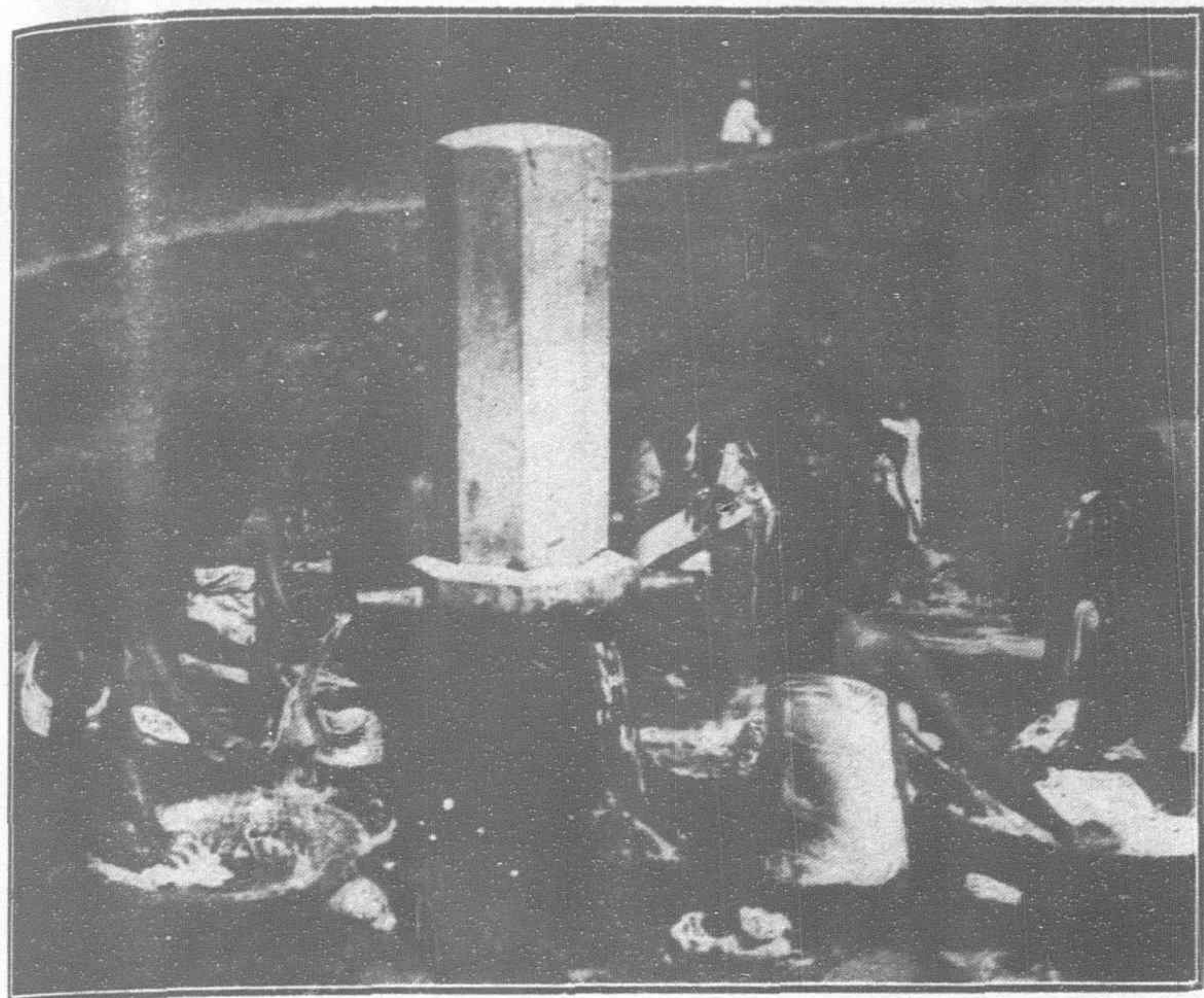
drain pipe which discharged the filth of the Tondo district into Manila Bay. One day, a native wandering along the black sands at low tide, was amazed to see a spring bubbling up through the ooze and mud, and lifting some of it to his lips, lo! and behold! it was fresh. Miracle! Miracle! he shouted, and ran and told his friends. Soon from all over the district the natives swarmed down to the beach to bear away in bottles and other receptacles the precious, miraculous fluid. And then the grim reaper began his harvest, and still the natives came to the shore at low tide for more of the wonderful water and the death list rolled up. The epidemic spread to the provinces and thousands were swept away. In tracing the origin of the epidemic, the health authorities were told of the miraculous spring, which, upon investigation, proved to

wells. These figures, however, are rather high, due to the epidemic of influenza which wrought havoc during 1918. In 1903, with a total Christian population of 6,987,686, there were 442,048 deaths. In 1918, with a total Christian population of 9,495,272, there were 384,180 deaths.

It became more and more evident in the early days of American rule, that no great improvement in health conditions could be hoped for because of the contaminated water supply charged with amoebic and other intestinal germs, so only by recourse to a wide spread system of artesian wells could the public health be preserved.

The results obtained have been most gratifying. The attitude of the government toward the encouragement of artesian well





A Typical Town Pump in the Philippines



At the Village Fount



Where many may use Free Water



Type of Public Service Artesian Water System



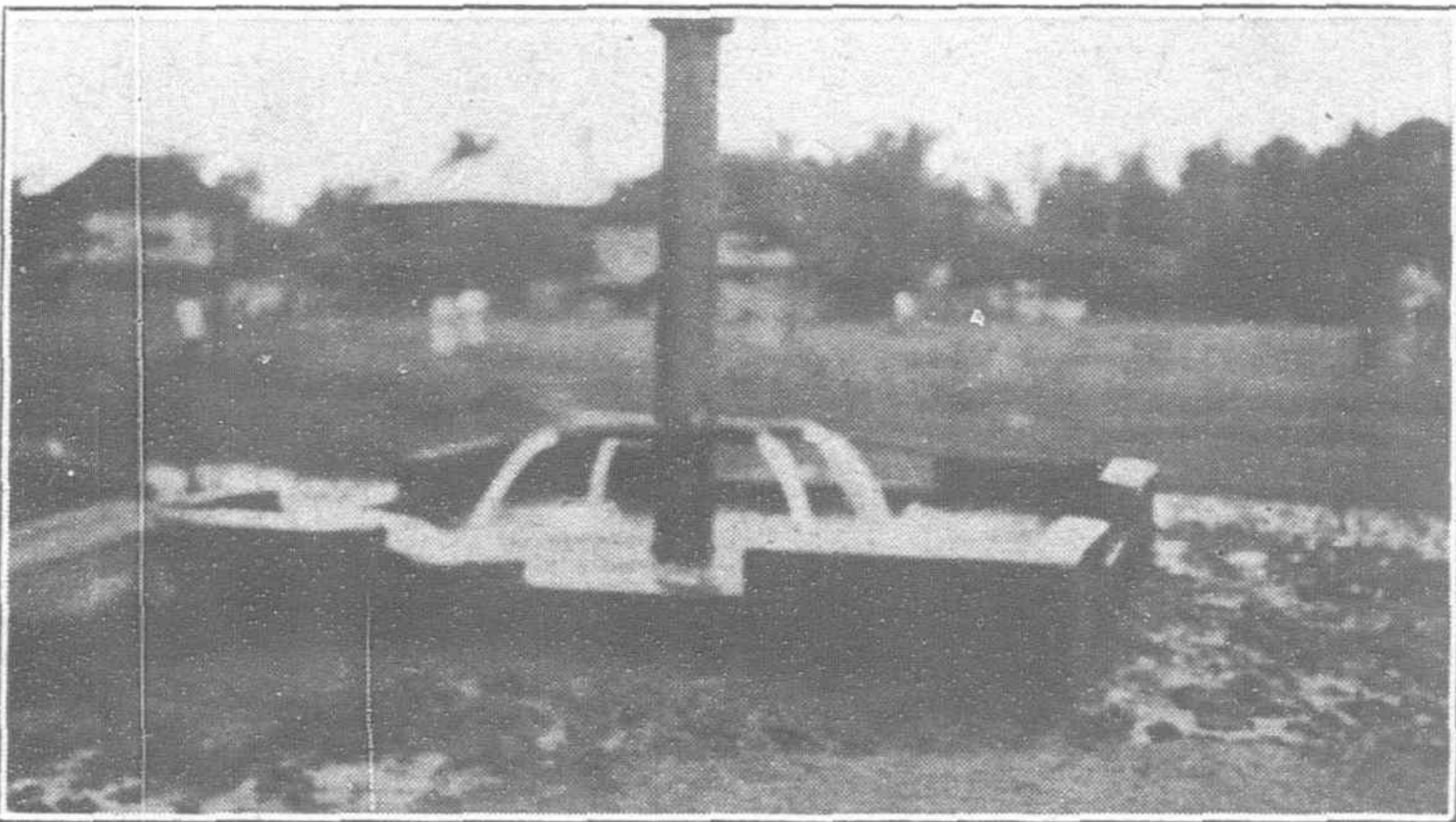
Large Public Artesian Well with Trough Equipment, Cebu



Fire Hydrant Opened. Pagsanjan Waterworks, Laguna Province



projects can best be shown by the money which has been appropriated to encourage this work and the results accomplished by the bureau of public works in the disbursement of this money. The Philippine legislation is constantly augmenting the appropriation for this purpose, and for the fiscal year 1919 voted \$450,000 as against \$200,000 for 1918. The appropriation for 1919, however, included the amount of \$200,000 set aside for the purchase of drilling



An Artesian Well, 400 feet deep. Flow 220 gallons per minute.

machines, equipment and supplies. These materials were requisitioned through the purchasing agent at New York.

In 1914 it was estimated that 1,500,000 people, or more than one-sixth of the population of the islands at that time, were supplied with water from artesian wells. At present the number benefited by these wells is over four-tenths of the actual population, which, if based on the report ending December 31, 1918, would be over 4,000,000 people, the population being 10,350,640.

While the greater portion of these wells are drilled as public wells for the municipalities and provinces, a good many of them are private wells, belonging to sugar centrals and other private enterprises and individuals. In Manila individual wells have been drilled for the city of Manila, the bureau of science, Manila Railroad Company, general hospital, boys' reformatory, nautical school and manufacturing concerns, besides the various wells drilled for the insular public buildings.

During the year 1920, the activities of the waterworks section were confined largely to work on systems begun during 1918 and 1919. Considerable difficulty was experienced in procuring pipe and machinery, in some cases more than one year having elapsed between the time of placing the order and receiving the material.

Three new waterworks were started during the year and 33 systems on which work was commenced in 1918 and 1919 are being finished. To date, 76 systems have been completed in the islands. There are 76 new systems in 29 provinces proposed for construction which will be accomplished as rapidly as the legislature provides funds therefor.

Waterworks projects completed to date furnish potable water to a total population of about 250,000 and have cost approximately P.2,000,000 while projects under construction will supply a population of 110,000 at an estimated cost of P.1,732,673. The 76 proposed systems contemplate supplying potable water to about 320,000 people at an estimated cost of P.6,000,000.

The high prices charged in recent years for pipe, and the limited resources of the municipalities concerned have delayed the financing of large waterworks projects at Iloilo and several other towns for which data have been available. Act No. 2894 passed by the fifth Philippine legislature, authorizing provinces, municipalities, and chartered cities to issue bonds under certain conditions for public works projects should facilitate the financing of waterworks projects, but thus far, none of these branches of the government have availed themselves of this law. The Bangued project in Abra province and the Santa Cruz and Majayjay projects in Laguna were, however, partially financed by bond issues authorized by Acts Nos. 2338 and 2773 respectively.

The status of all waterworks projects to date is shown in the following lists:—

List (A).—New waterworks projects begun in 1920.

List (B).—List of waterworks projects under construction, exclusive of list (A).

List (C).—Waterworks projects completed.

List (D).—New waterworks projects.

LIST (A).—Waterworks Projects begun in 1920.

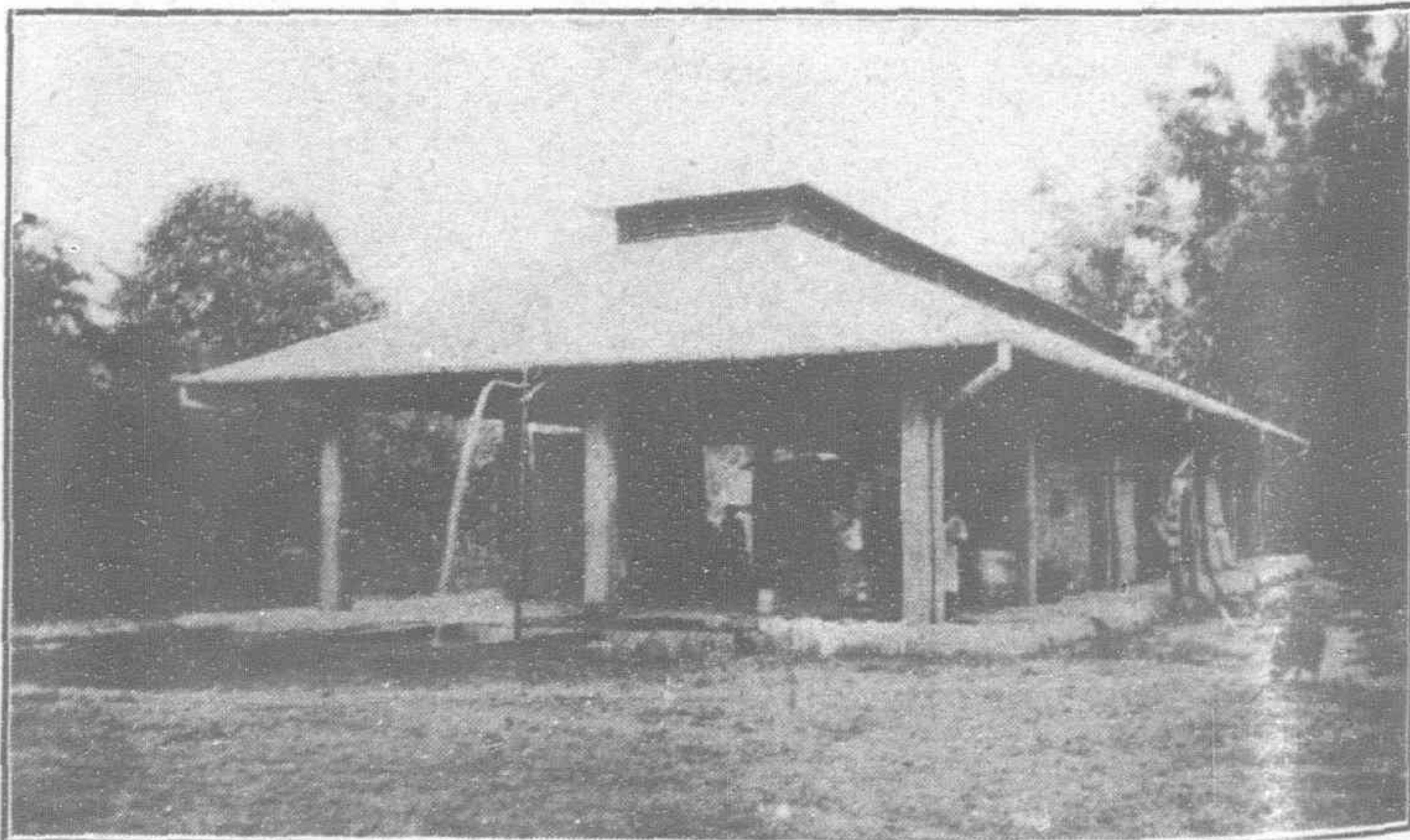
Province.	Municipality.	Popula- tion to be served.	Esti- mated cost. P.	Insular allot- ment. P.	Municipal allot- ment. P.	System.
Abra .....	Bangued .....	5,500	101,000	50,000	40,000	Gravity
Samar .....	Catbalogan ..	2,000	50,000	25,000	12,500	Do.
Tayabas .....	Mauban .....	3,500	40,000	25,000	12,500	Pump
Total .....		11,000	191,000	100,000	65,000	

LIST (B).—Waterworks Projects under Construction exclusive of List (A).

Province.	Municipality.	Type of system.	Popu- lation to be served.	Esti- mated cost. P.	Insular allotment. P.	Municipal allotment. P.
Antique ...	San Jose ....	Pumping ....	3,000	41,000	26,667.00	15,436.59
Batangas ..	Batangas ....	do. ....	6,147	72,125	43,600.00	27,768.63
Do. ....	Lemery .....	do. ....	7,200	42,000	25,000.00	15,411.19
Do. ....	Lipa .....	do. ....	5,000	90,000	50,000.00	30,000.00
Do. ....	San Jose ....	Gravity ....	4,000	46,300	23,000.00	11,500.00
Bohol ....	Tubigon ....	Pumping ....	4,800	30,850	20,000.00	10,000.00
Bukidnon ..	Malaybalay ..	Gravity ....	3,000	12,000	8,000.00	4,000.00
Cavite ....	Mendez-Nuñez	Pumping and hydro-electric	1,280	48,000	33,333.33	18,000.00
Cebu ....	Carcar .....	Gravity ....	6,400	55,000	36,400.00	18,200.00
Do. ....	Dalaguete extension ..	do. ....	1,333	50,000	5,000.00	2,500.00
Do. ....	Dumanjug ..	Pumping ....	1,500	30,000	20,000.00	10,000.00
Do. ....	Ginatilan ..	Gravity ....	1,600	13,800	9,000.00	4,800.00
Do. ....	Malabuyok ..	do. ....	1,200	15,000	10,000.00	5,000.00
Do. ....	Opon .....	Pumping ....	1,200	28,000	10,000.00	5,000.00
Do. ....	Poro .....	Gravity ....	800	9,000	6,000.00	3,000.00
Do. ....	Tudela .....	do. ....	800	9,000	6,000.00	3,000.00
Davao ....	Davao .....	do. ....	4,800	120,000	75,000.00	48,332.66
La Laguna ..	Santa Cruz ...	Pumping ....	6,000	70,000	46,667.00	23,333.00
Marinduque	Gasan .....	do. ....	1,400	20,000	13,333.33	6,500.00
Do. ....	Malbog .....	Gravity ....	1,000	15,000	10,000.00	5,000.00
Mindoro ..	Abra de Ilog ..	Gravity ....	330	5,300	3,000.00	1,500.00
Misamis ...	Cagayan .....	Pumping ....	3,000	33,000	22,000.00	11,000.00
Mountain Province..	Apayao .....	do. ....	800	7,000	5,000.00	2,500.00
Do. ....	Baguio .....	Pumping and gravity ....	5,000	130,000	90,000.00	37,500.00
Do. ....	Cervantes ....	Gravity ....	800	4,000	2,667.00	1,350.00
Do. ....	Trinidad .....	do. ....	1,500	30,000	30,000.00	—
Oriental						
Negros. ..	Dumaguete...	Pumping ....	4,000	48,600	30,000.00	15,000.00
Pampanga ..	Arayat .....	Gravity ....	3,840	13,200	8,800.00	4,400.00
Sorsogon ..	Bacon .....	do. ....	3,200	21,000	14,000.00	7,000.00
Surigao ...	Gigaquit ....	do. ....	2,500	7,500	5,000.00	2,500.00
Tayabas ..	Lucban .....	do. ....	3,200	45,000	25,000.00	15,000.00
Zambales ..	San Antonio .	do. ....	4,000	71,000	25,000.00	24,000.00
Zamboanga	Zamboanga .	Gravity and hydro-electric	4,375	309,000	75,000.00	203,570.00
Total .....			99,025	1,541,673	812,467.66	592,102.80

LIST (C).—Waterworks Projects Completed.

Province.	Municipality.	Popu- lation.	Cost.	System.	Remarks.
Albay .....	U.S. Reservation Regan Barracks	(b)	P.	Steam pumping	
Batangas .....	Balayan .....	2,000	7,333.92	Gravity	
Do. ....	Cuenca .....	2,500	5,000.00	do.	
Do. ....	Taal .....	5,000	89,507.17	Pumping	
Bohol .....	Davis .....	840	5,100.00	Gravity	
Do. ....	Duero .....	2,000	10,431.71	do.	
Do. ....	Jagna (a) .....	2,400	20,042.73	do.	
Do. ....	Loay .....	2,400	15,308.85	do.	
Do. ....	Tagbilaran .....	5,245	12,990.35	Pumping	
Bukidnon .....	Deliric .....	600	—	Gravity	
Do. ....	San Luis .....	500	650.00	do.	



Modern Market at Lubao, with Artesian Well.





Testing Pagsanjan Waterworks System, to 140 pounds pressure, Laguna Province

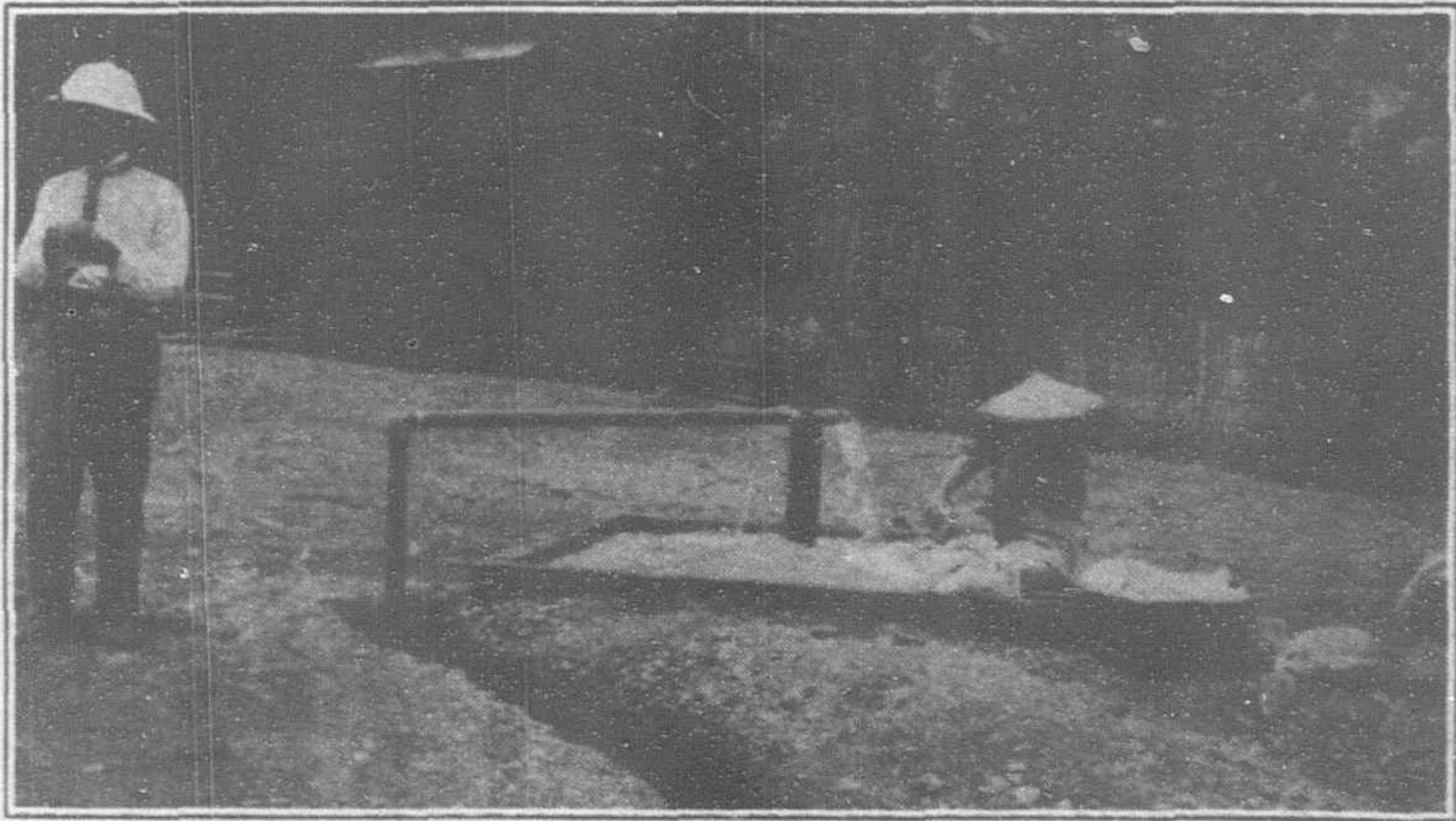
Province.	Municipality.	Population.	Cost.	System.	Remarks.
Bulacan	Hagonoy (a)	690	6,503.22	do.	Originally 1864, reconstructed 1900, by military government.
Capiz	Capiz	7,000	12,000.00	Gravity, circular concrete tank	
Do.	Romblon	2,300	—	Gravity	
Cebu	Barili	4,000	26,000.00	do.	
Do.	Catmon (a)	1,800	15,357.40	do.	
Do.	Cebu	40,000	437,757.77	do.	
Do.	Moalboal	3,000	15,000.00	do.	
Do.	Pilar (a)	1,000	9,000.00	do.	
Do.	Poro	800	9,000.00	do.	
Do.	Naga extension	2,000	4,500.14	do.	
Do.	Samboan	1,600	4,981.02	do.	
Do.	San Francisco	1,400	6,200.00	do.	
Do.	Sibonga	6,000	32,300.00	do.	
Do.	Tudela	800	8,659.90	do.	
Cotabato	Parang	600	9,600.00	Hydraulic ram	
Ilocos sur	Vigan	6,440	137,242.58	Gravity	
Isabela	Iligan, tank construction	—	—	—	
Laguna	Bay	1,471	2,797.21	do.	
Do.	San Pablo	7,000	85,550.75	do.	
Do.	Majayjay	3,200	37,179.05	do.	
Do.	Nagcarlang	2,500	32,858.33	do.	
Do.	Pagsanjan	4,044	73,782.67	Pumping	
Marinduque	Boac	1,000	6,653.00	do.	
Do.	Mogpog	1,280	10,535.69	Gravity	
Do.	Santa Cruz	2,560	20,696.23	do.	
Mindoro	Calapan	2,500	29,936.76	Pumpin	
Misamis	Baciregasay	3,284	3,500.00	Gravity	
Do.	Mahinog	5,727	6,000.00	do.	
Do.	Mambajao	14,446	30,000.00	do.	
Do.	Sagay	6,321	800.00	do.	
Mountain Province	Teachers' Camp and country club	500	(d)	do.	
Mountain Province	Mansion House	100	(d)	Pumping	
Oriental Negros	Siquijor Poblacion	1,587	18,000.00	Gravity	
Do.	Barric Siquijor	497	—	do.	
Do.	Luzurriaga	2,500	12,326.39	do.	
Do.	Talinting	2,890	5,025.00	do.	
Do.	Basac	265	—	Hydraulic ram	
Do.	Maria	1,121	—	Gravity	
Do.	Lasi	2,300	6,980.77	do.	
Palawan	Puerto Princessa	1,600	25,000.00	Pumping	
Do.	Coron	1,000	4,800.00	do.	
Pampanga	Angeles	6,708	2,600.00	Steam pumping	
Do.	San Fernando	100	(c)	Pumping	
Pangasinan	Bayambang	1,500	3,280.62	Gravity	
Do.	Dagupan	(c)	2,823.02	do.	
Do.	Lingayen	(c)	3,938.99	do.	
Do.	Lingayen	(c)	9,141.22	do.	
Do.	Mangaldan	(c)	635.53	do.	
Do.	San Fabian	(c)	682.87	do.	
Do.	Bani	2,000	12,022.27	do.	

Province.	Municipality.	Population.	Cost.	System.	Remarks.
Rizal	Antipolo	2,250	23,299.07	Pumping	Constructed by military
Do.	Pasig	10,000	40,000.00	do.	
Samar	Oras	4,000	—	Gravity	
Sorsogon	Magallanes	3,500	8,000.00	Pumping and gravity	Municipal building
Do.	Sorsogon	250	1,044.67	Pumping	
Sulu	Jolo	722	76,905.29	do.	
Surigao	Bacuag	3,944	7,500.00	Gravity	
Do.	Liang	2,032	1,924.58		
Do.	Placer (a)	1,200	13,436.17		
Tayabas	Lucena (a)	7,500	234,390.57		
Do.	Tayabas (a)	4,600	125,159.36		
Do.	Sariaya	6,000	37,935.00	do.	
Zambales	Subic	1,628	12,400.00	do.	

LIST (D).—New Waterworks Projected.

Province.	Municipality.	Estimated Cost. P.	Population.	System.
Albay	Guinobatan	—	12,300	No data
Do.	Albay and Legaspi	60,000.00	11,000	Pumping
Do.	Viga	15,000.00	3,316	
Batanes	Ivana	40,000.00	2,000	Gravity
Do.	Sabtang	—	748	No data
Batangas	Balayan extension	1,500.00	—	Gravity from Balayan tank
Do.	Rosario	30,000.00	7,000	Pumping
Do.	Santo Tomas	28,000.00	1,310	
Do.	Taal extension to Sambat and Buli	18,000.00	2,105	Gravity from Taal tank
Bohol	Antequera	9,000.00	2,600	Gravity
Do.	Carmen	6,100.00	600	
Do.	Corella	6,000.00	1,019	
Do.	Garcia-Hernandez	37,500.00	2,000	Do.
Do.	Loon	30,000.00	4,000	Do.
Do.	Mabini	6,000.00	—	Do.
Bulacan	San Miguel	50,000.00	2,308	
Cagayan	Aparri	100,000.00	3,284	
Do.	Lal-lo	15,000.00	996	
Cavite	Cavite	200,000.00	8,298	
Do.	Indang	42,000.00	2,000	Pumping
Do.	Silang	62,000.00	3,200	Gravity
Cebu	Alegria	38,000.00	660	
Do.	Asturias	92,000.00	1,086	
Do.	Argao	—	2,000	Pumping
Do.	Balamban	40,000.00	2,113	
Do.	Pilar	6,000.00	800	Gravity
Do.	San Fernando	30,000.00	2,398	
Do.	Talisay	30,000.00	2,000	Gravity
Do.	Tuburan	68,000.00	9,146	Pumping
Cotabato	Cotabato	62,000.00	1,250	Ram and gravity
Ilocos Norte	Laoag	150,000.00	25,000	Gravity
Iloilo	Iloilo	2,500,000.00	51,000	Gravity
Do.	Pototan	295,000.00	5,672	Do.
Laguna	Alaminos	12,000.00	1,127	Pumping
Do.	Calamba	30,000.00	3,463	Not decided
Do.	Magdalena	45,000.00	1,811	Gravity from Majayjay
Lanao	Dansalan	—	2,000	Hydro-electric
Leyte	Baybay	15,000.00	6,000	Pumping
Do.	Burawen	—	3,038	Gravity
Do.	Liloan	7,500.00	792	
Do.	Maasin	10,000.00	4,167	
Manila	San Lazaro Hospital	45,000.00	2,000	
Do.	School of arts and trades	27,000.00	800	
Misamis	Misamis	66,000.00	1,564	
Mountain Province	Kabuyao	—	800	Do.
Do.	Lubuagan	21,000.00	800	Gravity
Marinduque	Torrijos	23,000.00	1,075	
Nueva Ecija	Cabanatuan	102,000.00	4,800	
Palawan	Bacuit	3,100.00	1,000	Do.
Do.	Bintuan	4,500.00	1,000	Do.
Do.	Cagayancillo	—	1,066	Rain water tank
Do.	Concepcion	3,600.00	600	Gravity
Do.	Cuyo	4,500.00	800	Pumping
Pangasinan	Dagupan	—	4,436	No data
Do.	Malasiqui	30,000.00	2,613	
Do.	San Manuel	24,000.00	3,500	Pumping
Romblon	Looc	30,000.00	1,000	
Samar	Calbayog	20,000.00	5,907	
Sorsogon	Barcelona	22,000.00	2,285	
Do.	Sorsogon	—	1,396	No data
Surigao	Surigao	45,000.00	7,959	

NOTE.—For reference of (a) and (d) see footnotes at bottom of p. 44.  
(a) Completed, 1920. (b) Variable. (c) Market or School. (d) Not available.  
(e) Unknown.



Artesian Well at Santa Maria, Bulacan, with flow of 200 gallons per minute



# Regulations for Purchasing Chinese Railway Materials

**T**HE Chinese government railway department purchases annually supplies of all kinds to the value of \$20,000,000, the orders for which in the past have been placed by the managing directors of the various lines without reference to the ministry of communications. The difficulty in centralizing these purchases has arisen from the operation of loan terms and conditions which gave certain preferential rights to purchasing agents, a condition, which still exists, but is more or less ignored by the authorities in their desire to reduce expenses and concentrate the purchasing under one central bureau. This phase of the situation is dealt with in another article in this number of THE FAR EASTERN REVIEW. Under the direction of Minister Yeh Kung-cho a policy of efficiency and economy was introduced into the administration of the ministry of communications for the purpose, amongst other things, of purchasing materials, and the new minister, Mr. Chang Chih-tan, has authorized the drafting of a new set of regulations to govern the purchase of railway supplies in the future. The new director-general of railways, Dr. C. C. Wang, was also heartily in favor of some such scheme and prepared a memorandum which was approved by the minister and cabinet, and is now in force. It will be noted that public tenders, either limited or unlimited, are to be invited for all requirements exceeding \$5,000 in value.

## I. Specifications, Drawing and Samples of Materials

1. The term "materials" as employed in these regulations is applied to all materials and articles used on the railways and includes locomotive, passenger and freight cars, track materials, machineries and tools.

2. In connection with every purchase of materials by the railways, complete specifications and drawings or proper samples must be previously prepared, to be used as standards of the materials purchased.

When materials are received, their acceptance or rejection will be made, after inspection, in accordance with the requirements of the specifications, drawings or the samples.

3. Sufficient copies of specifications and drawings must be prepared to be given to those who desire to submit tenders for supplying the materials. When samples are furnished one or several of them are to be placed at a definite place for examination only by the suppliers if no more can be provided.

4. Chinese, English or French language may be used in the specifications and drawings. If the original is in English or French while the materials can be purchased in China, a translation in Chinese is to be attached. If the original is in Chinese while the materials have to be purchased abroad, attached translation in English or French is to be made.

## II. Invitation of Tenders

6. Whenever any single purchase of the same material of several similar materials is estimated to be over \$5,000, Chinese currency, an invitation of tenders is to be made. Special conditions under railway loan agreement are to be excepted.

7. When a material is produced solely by one manufacture and the exclusive agency for selling the material is held by one concern, and if the material cannot be substituted for by any other material, no invitation of tender is needed. If the agency is not exclusive, an invitation must be made to the several agents to submit their tenders under conditions same as those mentioned in Article 6.

If any supplier has made a long term agreement with any railway to furnish a certain material or number of materials even when that supplier holds no exclusive right otherwise of selling that material or those materials, no invitation of tenders is to be made. But the railways concerned are to report such agreements to the ministry within one month after the promulgation of these regulations.

When the railways desire to have these agreements renewed after their expiration they must ask for the approval of the ministry by stating the reasons for their renewal.

8. Invitation of tenders may be either limited or unlimited.

9. A limited invitation of tenders is made when the railways invite by correspondence only those reputable and reliable firms or manufactures to submit their tenders. For each invitation of this kind, three competitors at least must be selected for the purpose. Those who have never supplied materials to the railways before and the newly established firms or manufacturers may also be invited to submit tenders when they are found by the railways to be capable of supplying the materials needed or when they are willing to make proper deposits with the railways to insure their good faith.

10. Unlimited invitation of tenders shall be made by the railways through advertisement in the well-known newspapers at suitable localities and is open to all who are interested.

11. In limiting the period for submitting tenders, sufficient time must be allowed for the firms to carefully study the specifications, drawings or samples and to make their estimates. When the materials have to be purchased abroad, further allowance must be made for the firms to mail the specifications and drawings and to secure their quotations or any other information by cabling.

## III. Deposits

12. When the invitation of tenders is unlimited, those who wish to submit tenders are required to make each a deposit with the railways in addition to the payment for the cost of specifications and drawings.

13. The amount of the above-mentioned deposit shall be fixed by the railways according to circumstances.

14. The deposits will be returned to the bidders after the selection of tender has been made except the one whose tender has been selected and whose deposit may be transferred to the deposit for the contract.

In case the supplier whose tender has been selected announces his inability to supply the materials or fails to call at the railway offices for the signing of the contract within the stated period after the announcement of the selection of tender, his deposit made at the time of submitting the tenders is forfeited and also his right to supply the materials will be annulled.

15. The supplier when tender has been selected shall at the time of signing the contract, make a deposit with the railways.

16. The amount of this deposit for the contract shall be fixed by the railways according to circumstances and shall be clearly stated in the specifications.

17. The deposit for a tender or a contract shall be either in form of cash or acceptable bonds or a letter of guaranty covering the sum of cash required from any bank accepted by the ministry of communications.

## IV. Supervision over Tenders

18. Whenever the estimated cost of the same material or several similar materials to be purchased exceeds \$5,000, Chinese currency, the railways shall report to the ministry: (a) the kinds of materials to be purchased with specifications drawings or samples accompanying the report; (b) the amount and estimated cost of each material to be purchased; and (c) the way in which tenders are going to be invited (limited or unlimited), the date fixed for opening the tenders and the amounts of deposits required for tenders and contracts. When the invitation of tenders is limited the names of the firms or manufacturers to be invited shall also be stated. Only after due approval by the ministry the railways can issue invitation of tenders either by correspondence or through advertisement in newspapers.

19. The letters or advertisement for inviting tenders shall contain these words "with the approval of the ministry of com-



munications," this invitation is made to the suppliers to submit their tenders.

20. Irrespective of whether the invitation is limited or unlimited, all tenders submitted shall be opened on the prefixed date at the specified hour.

21. Whenever the estimated cost of the materials exceeds \$50,000 a delegate or delegates from the ministry of communications must be invited to be present at the time of opening the tenders.

22. The result of the opening of tenders must be reported to the ministry and, before the signing of the contract, the tender selected and the drafted contract shall be sent to the ministry for approval.

23. When several bidders and the manufacturers whom they represent are equally known and also when their terms of delivery and payment, etc., and about the same, the one whose bid is the lowest shall be selected to supply the materials.

24. Before the opening of tenders, or after the opening but before the signing of the contract, whenever it is discovered that the bidders have raised the prices through general agreement or attempted in any other way to hold up the government, the railways shall report to the ministry of communications to have the tenders submitted by those bidders made disqualified and the materials purchased in any other way deemed adversable under the circumstances.

25. All purchases of materials by the railways not in accordance with Articles 6, 18, 20, 21, 22 of these regulations are hereby disapproved and shall not be recognized except in case of *force majeure* when special approval can be requested for.

## V. Supplementary

26. Amendments to those regulations shall be proposed by the ministry of communications and become effective after they have been passed at a cabinet meeting.

27. All the above regulations shall be effective from the date of promulgation.

## Bang! Goes Another Door

THE *Chicago Daily News*, of September 1, publishes what purports to be an amazing contract between a Chicagoan and the Chinese republic, and in view of criticisms arising out of the Cassell Coal Mining Concession with the former military government of Canton and the opposition of the present southern cabinet towards its ratification, the following information is extremely interesting, significant and important, *if true*. And, if the story should be true, we may as well forget about the "Open Door." As Dr. Ma Soo, the delegate of the Canton government in Washington, has not officially denied the story of the contract, it is now up to Canton to declare itself. The *Chicago* paper says:

"George H. Shank, who occupies offices in the Stock Exchange building, becomes a partner with the 'Government of China' in twenty-year industrial development operations. He is given a practical monopoly of business concessions in the whole yellow republic. He undertakes to interest American business in China on an unprecedented scale. The government headed by Dr. Sun Yat-sen, at present known as the 'Government of South China,' which aspires to the conquest of the whole country and which has already overrun more than half of it, agrees, according to a contract he holds, to pay Shank one-third of the net profits of all industries organized and promoted through his efforts, as well as 25 per cent. on the purchase price of all material that may be bought from the United States government.

"The South China government pledges itself to issue a preliminary bond flotation of \$100,000,000 gold, 8 per cent. interest, to be used in the promotion of industrial development. If conditions warrant, other bonds will be issued. Their marketing will be left entirely to Mr. Shank. He will offer the bonds to American firms interested in China's development.

"Mr. Shank some time ago gained fame when he presided over the consular court at Shanghai.

"The first \$100,000 worth of bonds has been used up long ago, says Mr. Shank, and \$190,000,000 more promised to eager investors. The total issues of the South China government may amount to \$3,000,000,000 or \$4,000,000,000, he declares. Eighty-five large American corporations are said to have been interested, among them banks, railroads, construction firms, electrical houses, coal companies, etc. Contracts have been let, he says, for the building of many miles of roads and the entire reform of China's electricity system is planned.

"The government, which has signed this amazing contract, has been recognized by no foreign government. Springing from a revolution in 1917, it first proceeded to establish order in the province of Kwangtung (Canton) and from there to radiate out over the south of China. Late dispatches indicate that its troops have crossed the Yangtze-Kiang and are driving the Peking forces to the northward. It claims to have a popular mandate from a Chinese parliament sitting at Canton."

It would be interesting to learn the names of the eighty-five large American corporations alleged to be associated in this deal, and what steps, if any, the American government has taken to inform them of the risks they are running. Looking at the story dispassionately, it would seem that after all the chances of Mr. Shank and his syndicate to get their money back are almost as good as those of other Chicago financiers who have loaned money to Peking, for, unless Peking can squash Canton (a highly improbable termination to China's troubles), some compromise will be necessary, in which debts incurred by the South will be recognized and incorporated in any general reorganization loan. If, on the other hand, President Sun ousts President Hsu, the Shank syndicate will have to be recognized and, perhaps, added to the American group in the consortium. It looks like an even gamble after all. Any further speculation will only lead to a headache.

## A Book Review

TRAVELS OF A CONSULAR OFFICER IN NORTH-WEST CHINA. By Eric Teichnan, C.I.E. Published by the Cambridge University Press. Price 25s. net.

It is not improbable that the reading of this book by anybody other than one who contemplates going over the same trails and by-ways will prove to be somewhat of an effort. The general reader will be led over roads, through towns, across frozen streams, at certain times on certain days; he will be awakened at early hours of the morning to start on a day's travel which is to be but slightly dissimilar to that indulged in on the previous day and which has been planned after due disregard for supposed obstacles which Chinese officialdom declares to exist; so that all in all, his day in and day out are so much of a sameness that as time goes on the journeys become a trifle monotonous. He wishes perhaps that some alarming adventure would make a break in the steady progress, the precise and uneventful journey. If only a pheasant shoot, taking ten pages of graphic English to describe, were indulged in on the way, something to lend color, a little personal enjoyment, if not from the æsthetic point of view at least in the daily contact with the native whose sense of humour everywhere in this vast country is such as to enliven whenever contact that is not inhuman is made. If the general reader is content only to note the type of pony that is used in the land over which he is lead in travel, the topography of this land, and the distances between each point of travel, then he will endure the journeys and will derive much benefit in the way of really authoritative information. He will also part from the author the gainer in a vaster knowledge of China, especially of a territory so little known to foreigners, and he will, above all, be accurate in such information as will be of great help to future travelers over the same regions. A mind intent upon imparting correct information is, as a rule, steered against impressionistic deviations, particularly if a not too bulky volume is its goal, so that while much has been lost to the romanticist, the gain to the realist has been great.

Apart from some discussion in regard to China's administration of interior places and an expression of views as to "the need for reform in the type of Christianity now being propagated amongst the Chinese," views which are unquestionably those held by a large number of non-missionary sojourners in these parts, some of whom, no doubt, decry even the presence of Christians other than school teachers and doctors in a country where other religions seem to fulfil, very admirably, the correct usages and requirements of any religion, there is little in the book except accurate and somewhat tedious travel as we have already implied. But this in itself is so important in a land where correct knowledge of interior places is quite inadequate, that considerable credit is due to the author for the faithful record he has presented of his travels. It is a fine contribution to the meagre store of information on China's hinterland and as such is deserving of commendation.

C. L.



# FAR EASTERN IRON AND STEEL

**YAWATA IRONWORKS.**—The Yawata Ironworks has been approached by the Osaka iron merchants' guild with a demand for the increase of the rate of discount. The ironworks have now announced its decision to give a discount of Y.1.50 per ton to contracts for 200 tons of rails, channels, etc., Y.2.50 for 400 tons, Y.4 for 700 tons, and Y.6 for 1,000 tons. With regard to other brands, agreements for 200 tons will receive a discount of Y.3, 400 tons Y.5, 700 tons Y.8, and 1,000 tons Y.12. With the present increase, production, it is said, will result in a loss of Y.15 per ton.

\* \* \*

**IRON INDUSTRY ENCOURAGEMENT ACT.**—A statement appearing in the Japanese *Official Gazette* of the recently enacted iron industry encouragement act and amendments thereto has been forwarded by Trade Commissioner H. A. Butts. It was expected that this act would be made effective as of July 1 by an imperial ordinance, but it now appears there will be an indefinite delay. One provision of the act is that any person engaged in the iron industry with equipment to produce at a single place 5,250 metric tons or more yearly of pig iron or steel may be exempt from taxes on his industry and from income taxes on the profits yielded in the year in which the industry is started and for the following 10 years. The 5,250 metric tons mentioned shall mean 2,500 metric tons in the low phosphorus pig-iron industry.—*Commerce Reports*.

\* \* \*

**FAR EASTERN STEEL BUSINESS WITH AMERICA.**—Japanese buying continues on a slightly smaller scale. Orders for copper are still being placed in the United States, one New York exporter having booked an order during the past week for 200 tons of electrolytic copper to a Japanese buyer.

The South Manchurian Railroad continues to buy lightly and an inquiry is being handled by one Japanese export house for about five miles of 60-pound rails and five miles of 75-pound rails. An inquiry is in the hands of the American subsidiary of a French interest, calling for about forty passenger cars for a Chinese railroad.

The Bombay water supply pipe line bids show a great divergence. It is understood that one American bid for the pipe line, fabricated and set in place, was somewhat over \$11,000,000, while the bid of Braithwaite & Co., West Bromwich, England, was something over \$5,000,000.

This low bid was for riveted pipe, while the American bid was for the lock bar construction. Allowing in the case of the English bid some \$2,000,000, which it is estimated will be less than the cost of laying the pipe, there is left over \$3,000,000 for the material fabricated delivered.

As there are about 80,000 net tons of material involved, it would appear that the unit cost of the fabricated steel pipe is about 2 cents a pound delivered. These figures are as yet unofficial. It may be added that the work will take two and a half to three years for completion.

Japanese buyers continue to place small orders in the United States, but considerable purchasing of German material is reported, the Japanese claiming that the quality and workmanship are improving. Sheet buying continues, but although the total of recent purchases by Japan in the United States is fairly large, virtually all purchases have been of black sheets, Nos. 28 to 31 gauge, the heavier sheets being placed with British makers, which are not in a position to quote as advantageously on the lighter gauges as the American mills. Low prices are insisted upon by Japanese buyers.

One exporter in New York, who recently quoted a price to Japan, based on \$43 per ton, Pittsburgh, for a tonnage of 35-lb. rails, including splice bars, bolts and plates, was informed that a quotation about fifteen per cent. lower had been received. A bid of 1.65c per lb. Pittsburgh, on an inquiry for 800 tons of bars to be rolled to specifications was also turned down by a Japanese buyer, who stated that the price was too high.

An inquiry is now in the market from Japan for about 430 tons of structural steel for a bridge which will probably be awarded some time ago. One Japanese exporter recently booked an order for about 630 tons of 80-lb. rails for the South Manchuria Railroad.

\* \* \*

## COST OF IRON AND STEEL PRODUCTION IN CHINA.

The next group of items of cost is manufacturing expense. This comprises power, light, water, supplies and stores, replacement of tools, repairs and maintenance, new minor works, transportation in the works, laboratory expenses, depreciation and royalty. Steam power is supplied by boilers belonging to the department. Electric power, which is also used in the smelting plant, as well as light and water, is supplied by the mechanical department of the same works. Heat, an ordinary factor of cost, is unnecessary for those working at the furnaces, and for the office rooms and repair shops it is charged to "general expenses" or "repairs and maintenance." "Supplies and stores" includes all materials requisitioned for use of the furnaces or the blowing or pumping plants, except

those that are in the nature of tools, which come under "replacement of tools." Yet, in actual practice, it is found that the line of demarcation is very hard to draw between the two, and consequently the latter heading has been abolished.

A similar difficulty is experienced in making a distinction between "repairs and maintenance" and "new minor works." The problem is only solved by arbitrarily assigning all works involving a cost of more than \$500 to the latter, and those of less than that value to the former as maintenance. Of course very large capital outlays are entered in the capital accounts, and are charged off to the cost of production as depreciation. The transportation expenses are confined to the transportation of pig iron in the works, as charges for transporting raw materials and supplies and stores have already been taken account of under these two headings. The laboratory expenses are charges of the laboratory department for testing pig iron, etc., for the blast furnace department.

Provision for depreciation is always a difficult question, as different plans have different advantages. But where a plant has been working for many years without a proper system of accounting—as is the case with the Hanyang Works, where even the original cost of constructing the plant is more or less forgotten it becomes ten times harder to provide for depreciation. To make the best of the situation, a blanket charge of 5 per cent. on the value of the plant is written off every year as depreciation, and the basis of calculation is taken from physical valuation. The whole work has been valued more than once, but the most detailed estimates were made in 1909 by two foreign engineers engaged by the Hanyehping Company. The figures for blast furnaces are as follows:

	Tls.
Furnaces Nos. 1 and 2 (including blowing and pumping plants and boilers) ... ..	1,200,000
Furnace No. 3 ... ..	1,400,000
Elevated railway for conveying ore and coke to the furnaces ...	200,000
	Tls. 2,800,000
	or \$ 4,200,000

Five per cent. on this sum means \$210,000 a year or \$17,500 a month.

The last item in this group is royalty. As early as 1897, it was agreed between the government and the works that, in consideration of the government shares and advances previously made to the works, the latter should pay as royalty one tael for every ton of pig iron produced. This item of cost, therefore, varies directly in proportion to the quantity of production. The percentage of all manufacturing expenses combined ranged in 1919 between 59 and 13.2. This, too, is very low compared with corresponding items for iron production in foreign countries.

The general expenses include both the overhead charges of the blast furnace department and those of the whole works. These two expenses form the last two groups of cost items in pig-iron production. The former varies from 3.9 per cent. to 6.2 per cent. of the total cost, and the latter from 4.5 per cent. to 7.7 per cent. The "financial" expenses consist of only one item, the interest on capital outlay. Much as has been said against the inclusion of interest in the cost of production, there is strong justification for its inclusion when the company controlling the production is heavily in debt, and its plant is virtually mortgaged to the creditors. The Hanyehping Company has borrowed heavily from Japan, and for such loans it must pay fixed interest charges. If these charges are not, in a sense, distributed over the products, the Company may be losing money when the selling prices of its products apparently include a wide margin of profit. The high percentage of this item, interest, compared with other cost items shows how easy it would be to reach such a paradoxical result.

Taking all cost items into consideration, we find that direct wages constitute the smallest percentage, and raw materials the largest. And the ratio between the two is as much as 1 to 90 (for March 1919). Such conditions cannot be found elsewhere. The percentages for manufacturing and general expense are not unusual, although they are lower than like percentages in other countries. The charge for interests is rather high, but this is due to the special conditions under which the plant is being worked. The following table is compiled from the cost data at the blast furnace department:—

Month	per ton	Materials	Labour	Manufacturing Expenses	General Expenses	Financial Expenses
1919	\$	%	%	%	%	%
January ...	47.42	76.9	1.2	11.4	4.0	6.0
February ...	45.32	72.7	1.4	12.0	6.1	7.7
March ...	52.98	73.6	0.8	13.2	6.2	6.2
April ...	48.21	75.6	1.2	12.3	5.2	5.7
May ...	47.72	77.6	1.1	12.3	4.2	4.8
June ...	47.50	78.5	1.0	11.8	3.9	4.8
July ...	50.47	79.8	1.0	10.5	4.3	4.6
Average for 7 months ...	48.51	76.4	1.1	12.0	4.8	5.7

(To be continued).



# Engineering, Financial, Industrial and Commercial News

## AGRICULTURAL

**Extensive Schemes Drawn up by General Chang.**—General Chang Tso-ling, inspector-general of Manchuria provinces, is prepared to carry out the following schemes in connection with his grand plan for bringing Mongolia under cultivation:—

- (1) To organize a gigantic reclamation and exploitation company by the central government with co-operation of local officials, in which Chinese and Mongols out of work will be employed.
- (2) To exploit the agricultural land on basis of old Chinese system, viz., eight-ninths of the crop will be allotted to the planters to reward their labor while one-ninth to the officials as land tax.

**Good Prospects of China's Wheat.**—Though the harvest of the wheat crop of the whole world is not likely in general to be good this year, China's crop of wheat is reported to be good, especially in Manchuria. In 1896 the three eastern provinces yielded only 36,000,000-lb., but the output increased to 900,000,000-lb. ten years after. Judging from this, there is good reason to believe that China's wheat crop will stand first in the world some day.

## AUTOS

**A New Autobus Service.**—The Honan provincial authorities have granted Mr. Pao Ping-shu, a Honan merchant residing in Hupeh, permission to form an automobile transportation company to run a motorbus service at Chow-kow, Lai-hu, Hsu-chang and Yih-chen.

**Tientsin-Paoting Autobus Service.**—Messrs. Chang Yu-shih, Chen Chung-ling, Wei Cho-nien and Wang Shu-kar, promoters of the Paoting-Kaoyang Automobile Transportation Company which was inaugurated on April 24, 1921, under the approval of General Tsao Kun, have suggested the sphere of their business be extended by running a motor service from Paoting to Tientsin, and the proposal has received favorable consideration by the civil and military governors of Chihli. The new company is to be capitalized at \$100,000 in 500 shares of \$200 each, and will have its head office at Tientsin with a branch at Paoting and stations at Zing-hai, Dah-cheng, Jen-chu and Kao-yang. Arrangements for purchasing land, constructing bridges and erecting warehouses are being carried on steadily.

**Automobile Exhibition Planned for Calcutta, India.**—It is learned through Trade Commissioner C. C. Batchelder that the Eastern India section of the Motor Trade Association will hold an exhibition in Calcutta during the coming winter, the exact date to be announced later. This will be the first exhibition of its kind in Calcutta since 1906. Only members of the association and affiliated organizations will be permitted to exhibit, but as these comprise all the leading automobile and accessory houses it is expected that a large number of automobiles, trucks, tractors and motor boats of the latest models, and accessories of all kinds will be shown.

**Automobile Transportation Co. Proposed, Shantung.**—It is reported that Mr. Moh Fandong has applied to the industrial bureau at Tsinan for the organization of an autobus transportation company with a capital of \$20,000 to operate a regular service on the newly-built road from Tsinan to Lao-kow.

**Autobus Service Planned, Shantung.**—According to report from Tsingtao, a certain Mr. Liu has associated himself with the gentry of Tsingtao and Ping-doo for the organization of the Kao-Tung Automobile Transportation Co. to run a regular service in eastern Shantung and has decided to build an automobile road between Lan-cheng and Ping-doo as its first line to be operated.

## AVIATION

**A Water Glider for Use in China's Commerce.**—The *Journal of Commerce* announces that satisfactory trials have been completed on the River Saone in France with a new type of water glider, fitted with a six-cylinder motor, which has been ordered by the Chinese government for the conveyance of merchandise and passengers on the great rivers. The makers claim that in favorable conditions the machine is capable of exceeding 50 miles an hour when carrying 12 passengers.—*Reuter.*

**Extension of Aviation Activities, Japan.**—The Japanese war office has a scheme under contemplation for extending the scope of the aviation corps. It proposes to establish a bombing corps. It has estimated Y.10,000,000 in the next year's budget, Y.5,000,000 being claimed for the first year of its initiation.—It is understood that this decision is not a consequence of the forthcoming disarmament conference.

**Japanese Company to Manufacture Airplane Propellers.**—According to the *Osaka Mainichi Shimbun*, a Japanese company manufacturing pianos and organs has been designated as a factory to manufacture airplane propellers. It is understood that this company, in addition to the manufacture of pianos and organs, developed since the outbreak of the war, a large export business in harmonicas, chiefly with the United States. In recent months it has encountered such formidable competition from German goods, said to be better and cheaper, that it decided to initiate this new business.

**The Success of Chinese-made Sea-Planes in Foochow.**—The sea-planes constructed in Foochow have been tested twice by Mr. Hackey, manager of Brunner, Mond & Co. Great satisfaction was shown as the result of the tests. It is generally believed that this is the first success in the history of the construction of sea-planes in China.

**Arrival of the New Pilots.**—It is reported that the aeronautical department has engaged four new pilots from England and America for the service on the Peking-Shanghai Air-line. These are Capt. Jones, Capt. McMullin, Capt. Campbell Orde and Capt. Dollan. They have arrived in China and have commenced work.

## BRIDGES

**New Bridge for Canton.**—The dilapidated wooden bridge spanning the creek separating East Bund from Tai Sha Tou Island at Canton will shortly be replaced by a modern concrete bridge. While the new bridge is under construction a temporary bamboo bridge will be built for light traffic.

## BUILDINGS

**New Amusement Resort Planned.**—A Hangchow merchant, Mr. Chu, is the promoter of a scheme for building an amusement resort at the West Lake

on the same lines as the New World here. A piece of land at the corner of Ping Hai Road near the lake has been purchased for the purpose.

**Railway Hotels for Chinese Government Railways.**—The ministry of communications has recently sent a circular telegram to the various railway administrations under its control, stating the necessity of opening railway hotels at principal ports along Chinese railways and pointing out the successful result of such institutions conducted by the South Manchuria Railway. The telegram adds that the Tientsin-Pukow line has decided to build hotels at Tsinan, Tai-an and Chu for, and Peking-Hankow line is choosing a site for the purpose at Si-ling and Tih-kung-shan, and in conclusion it instructs the various administrations to make plans for carrying out similar works at suitable points so as to afford comfort and convenience to the travellers.

## COMMERCIAL

**Market in Dutch East Indies for Tobacco Spraying Outfits.**—Experiments are being conducted in Sumatra leading to the eradication of insect pests injurious to tobacco plants, both in the seed beds and in the field. Native methods and spraying devices of other countries have been tried and found unsatisfactory, and therefore catalogues and specifications of the various types and sizes of modern spraying machinery are now desired from the United States, writes Consul C. O. Spamer. The price of each outfit should be stated. Quotations should be c.i.f. Belawan (port of Medan) if possible, and be given in lots of 100. After a thorough study of the merits of each machine the manufacturers will be asked to send samples for actual demonstration upon the tobacco estates. Hand sprayers of 15 to 20 liters capacity are first desired for use upon seed beds. If these prove satisfactory, orders will be placed for machines for field use. The latter should have a capacity of 20 to 50 liters. The ultimate purchase of the seed-bed spraying device, which meets the requirements of the experiment station, will be about 1,000 outfits. The number of larger machines ordered will depend upon the success of the smaller machines. Shipping and packing instructions, terms of payment, etc., will be arranged after a satisfactory machine has been selected. All communications may be in the English language. The address to which catalogues may be sent is available upon request to the Far Eastern division.—*Commercial Reports.*

**Trade Promotion, Japan.**—The South Sea Traders Union has been incorporated with a capital of Y.1,000,000 for the purpose of promoting trade in the South Seas by guaranteeing export and import bills or letters of credit, with special reference to those issued or accepted by its own members.

The chambers of commerce are urging the railway to grant a discount in freight rates on export cargo and fuel. The reduction in rates would stimulate export trade while reduction in coal transportation rates would benefit domestic industries. The Yokohama Export Association's application for a reduction of European Kyushu rates has not been favorably received. The exporters maintain that rates are out of proportion to the value of the goods, but the steamship companies reply that a 40 per cent. reduction this year, as previously granted, is more than should have been expected, considering the increased cost of operation.

The federated chambers of commerce have petitioned the government to supply to exporters of reputation sufficient capital at low rates of inter-



est to insure an improvement in the nation's foreign trade. It is rumored that the government, through the Yokohama Specie Bank, will make a loan of Y.2,000,000 at low interest to finance Russian trade.

**Java's Trade Prospects.**—The annual report of the president of the Java Bank says that the general economic situation in the Netherlands Indies is not brilliant but there is no question of an economic collapse.

The normal demand for Indian products will return as soon as normal world-conditions return.

The conditions of trade, industries and agriculture in the Dutch Indies need not give reason for any great anxiety for the future.

The position of the Java Bank and the mutual co-operation between other banks in the Dutch Indies is a guarantee that the difficulties of the Dutch Indies will be overcome earlier than elsewhere.

The Dutch Indies is not standing on the eve of an economic downfall. The Java Bank dividend is 35 per cent.

## COMMUNICATIONS

**A New Line Proposed, Chang-Nu-Shan.**—A plan has been prepared by several prominent figures of Chang-nu-shan, Chekiang, for the construction of a motor-road or a light railway in that city to facilitate communications between Chekiang and Kiangsi, and the proposal is under consideration of the local magistrate.

**North-West Automobile Transportation Co.**—It is stated that a certain ambitious Chinese capitalist will give financial support to the North-West Automobile Transportation Co., Kweihua, and its rapid improvement in business is therefore expected. An autobus service will also be inaugurated between Pao-der-ching and Wu-yuan and additional lines will be opened from time to time.

## DEVELOPMENT

**Singapore's Needs: \$100 Million Scheme.**—At a special meeting of the Singapore municipal commission, the president and the chief engineer outlined the needs of the town and the bringing up of all the departments to a satisfactory state, involving the spending of \$100,000,000 in ten years. The scheme needs the flotation of a loan and also an increase in the rates to 32 per cent. together with government grants and fresh sources of revenue. The meeting approved the scheme.

The requirements of Singapore, according to a summary of the report made by the *Free Press*, are:—

More water now and a margin of safety for the future.

Eighty-five per cent. of the roads to be reconstructed.

Water-borne sewage for the other 98 per cent. of houses.

Electric light for streets and houses.

Cheap and efficient tram service.

Re-housing schemes and arterial roads.

New abattoirs, new municipal offices, houses for staff, new small town hall, landing facilities and extensive reclamation works.

**New Corporations Under Organization.**—According to latest report to hand, the following corporations are being organized:—

Shih Sing Agriculture and Labor Bank, Wai-ping, Chihli.

Cereals Exchange of Suiyuan by Mr. Li Ngao-ching.

Kwei-Sui Electric Light Plant at Kwei-sui by Mr. Yung Yao-chen.

Kung Lee Coal Mining Co. by Mr. Feng Kung-doo.

Song Huh Chen Leather Co. by Messrs. Tser Song-dang and Chang Ting-kai.

Wang Jao Dyeing and Weaving Co., Kiangsu.

**Registration of New Corporations.**—According to report to hand, the following corporations have been lately registered with the ministry of agriculture and commerce:—

Chow Chang Telephone Co., Chow-cheng, Shantung

Tah Foong Dyeing Co., Ltd., by Mr. Yue Pao-shan.

### Development of Sungkiangchin, Heilungkiang.

With regard to the opening as a commercial port of Sungkiangchin, a town in Heilungkiang situated on the northern bank of the Sungari River opposite Harbin, a series of schemes has been drawn up by the port work office, the following being a summarized account:—

- (1) A strong modern embankment will be raised along the Sungari River from the iron bridge of the Chinese Eastern Railway over the Sungari River to Foo-lan Sugar Factory, a distance of about ten *li*, and in future wharves will be built at suitable points.
- (2) Three main streets each having a width of 110 feet to be reserved for laying of tramway track, and many branch streets with a width of 80 feet will be built.
- (3) A light bridge will be built over the Sungari River to connect the port with Harbin.
- (4) A railway costing about \$6,000,000 will be constructed from the port to Hai-lun, about 500 *li* in length.

**Registration of New Corporations.**—According to latest report to hand, the following corporations have been officially registered with the ministry of agriculture and commerce:—

Dung Woo Match Box Factory, Chekiang.

Kwang Hua Electric Light Plant, Pengpu.

Yue Ching Flour Mill, Chihli.

## ELECTRICITY

**Formosan Hydroelectric Project.**—The Formosan hydroelectric project is to be carried through, reports Commercial Attaché James F. Abbott, which is contrary to his previous impressions on this matter. The copper for the transmission lines has been bought, taking advantage of the present low prices. This project was reported in further detail in *Commerce Reports* for June 10, 1921.—*Commerce Reports*.

**New Electric Light Plants Under Organization, Kashing.**—Mr. Shun Nien-zai has secured permission of the Kashing authorities to open an electric light plant in Ka-zai, a district near Kashing. Mr. Chu is proposing a similar organization at Pu-yuan-chen, Kashing, and another electric company at Sin-dung-chen, Kashing, will probably be established in October.

### Electric Light Plant Established, Hwai-ying

—After registration with the ministries of communications and agriculture and commerce, the Lee Hwai Electric Light Co. has officially opened for business.

**A Hydro-Electric Scheme.**—Reuter's service from Tokyo mentions the scheme under way to establish the Abukumagawa Hydro-Electric Co., and the Tokyo Electric Transmission Co. The first will have a capital of 10,000,000, and develop 55,000 kw. by harnessing the Abukuma River, Fukushima, while the other company will have a capital of Y.30,000,000, and supply this power to Tokyo. Application has also been made to the government for a charter to construct a high-speed electric railway between Tokyo and Nikko, a distance of 80 miles. Under this scheme it is proposed to cover the distance in two hours.

### Electric Plant is Planned; Rubbish for Fuel.

—Suburban residents of Tokyo who have been suffering from the accumulation of rubbish and waste materials amounting daily to about 25,000 *kan* in weight recently decided to utilize it for fuel of electric power stations. It was decided at the meeting of the residents of Shibuya, Sendagaya, Yodobashi, Okubo and other suburban districts in the western outskirts of Tokyo held recently that two power stations installed with furnaces for consuming rubbish should be established with the capital of Y.500,000 near the crematory at Okamidani, Yoyahata, and the Gunritsu Hospital at Kashiwagi, Yodobashi, as a

joint enterprise of the seven suburban districts. According to the plan, 5,000 *kilo* of electricity is to be gained by the daily consumption of 25,070 *kan* of rubbish and the construction of the power stations is to be contracted for immediately. As a result of investigation carried out in Yokohama the rubbish and wastes in Japanese towns are said to contain twice the amount of combustible materials compared with that in England. It is estimated that the enterprise will yield a daily profit of Y.388 or 5 sen per *kilo*. The proposal is expected to be launched soon, according to the paper.

**Some Electric Light Plants Under Organization, Soochow.**—Since the introduction of electric light to Wang-tee, Soochow, many towns of the district are contemplating the organization of electric plants. In Hu-kwan a company has been promoted by Mr. Chang Chung-ting and is expected to operate within this year, machinery having been ordered from Shanghai. In Mo-do-tze a similar plant is also being organized by Mr. Nieh and operators will begin as soon as the machinery ordered from Shanghai has been installed.

## ENGINEERING

**Suction Gas Plant for China.**—Attention is being drawn to the demand for suction gas plant in China. Its relative cheapness appeals strongly to the Chinese. Whilst the course of exchange is just now retarding the installation of new machinery on a large scale, the demand for new plant by local electric lighting companies is becoming increasingly urgent. In these circumstances, the employment of suction gas is recommended. In the centres most concerned coal is obtained locally, anthracite usually being available, and its price is not subject to the vagaries of exchange. The installations of suction gas plant at present in operation have created a very favorable impression. Several concerns in China supplying light and power are taking steps to obtain additional capital. As they must soon come into the market for machinery for extensions and renewals, it is believed that an important potential demand is developing for prime movers operating on suction gas.

**Engineering Works Inaugurated, Hsuehchow.**—As a result of industrial development in Hsuehchow, there has been a great demand for machinery and other engineering tools in the city. With this in view, Mr. Nu Hsian-ting, proprietor of Tsing Heng Printing House, has opened the Tsing Shun Engineering Works to manufacture weaving machines, gins, printing machines, etc.

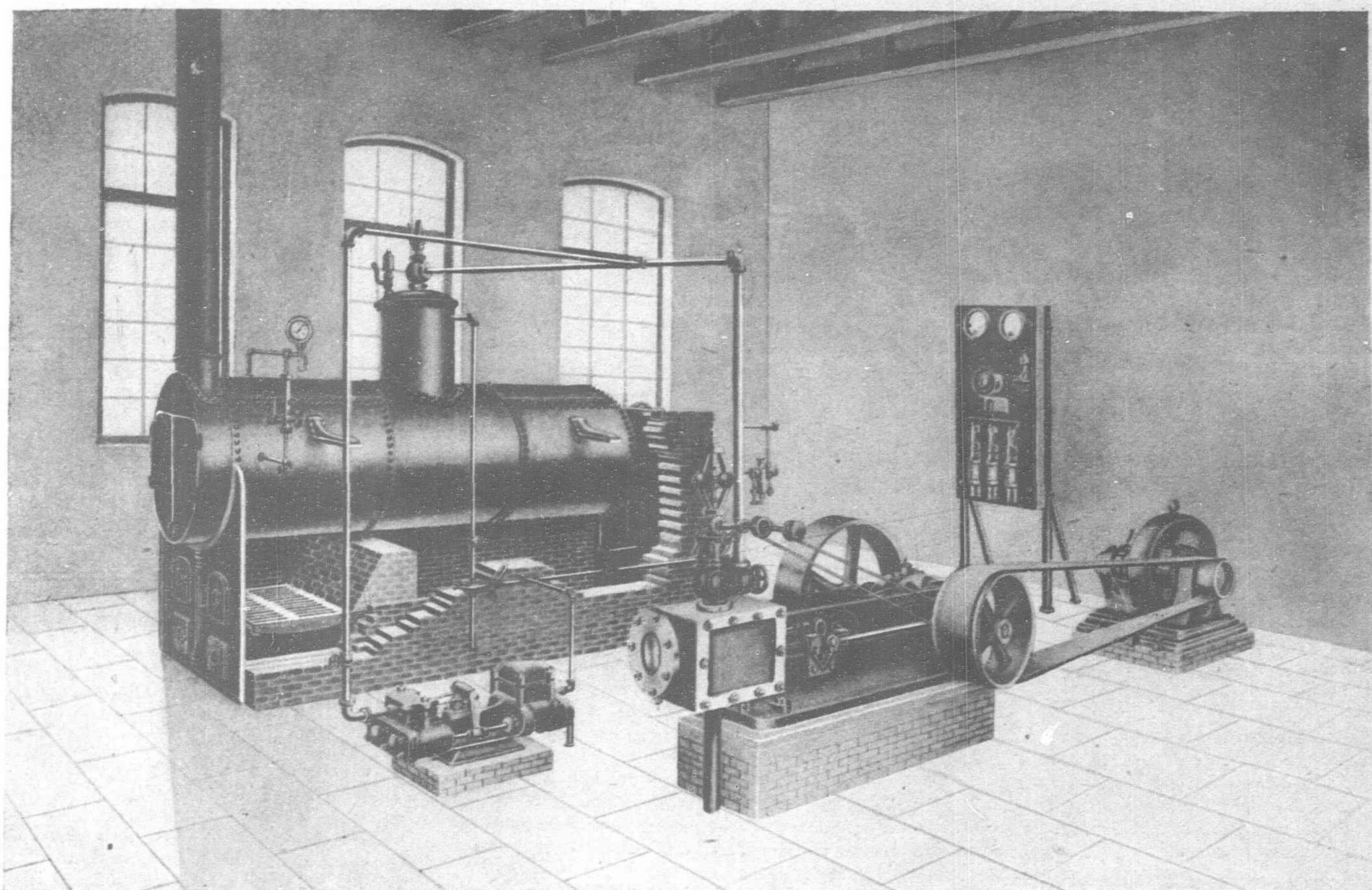
**Chinese Iron Works Co., Woosung.**—The Chinese Cotton Mill Owners Association, Shanghai, is organizing the Chinese Iron Works Co., at Woosung, to manufacture machines and engineering tools for cotton mills' use. The company is capitalized at \$300,000 in 3,000 shares of \$100 each, and the factory building on a site of 40 *mow* will be completed at the end of the year.

**Orders for German Machinery in China.**—It is reported that Mr. Kokan, manager of Siemens China Electrical Engineering Co., has recently made a bargain for supply of machinery and engineering tools to a new coal mining company which is to be situated at Kung-chen-jao, Hangchow, organized by General Lu Yung-hsiang, tuchun of Chekiang, with an object to exploit coal resources in the vicinity of Hangchow and to melt and cast mineral products actuated along the lower courses of the Yangtze. A heavy shipment of machinery including 6 tramcars and various kinds of electric supplies have been ordered from Germany by Mr. Kokan on behalf of the proposed mining company and Shanghai Chinese Tramway Co., and a part of the machinery has been already carried to Shanghai by Japanese steamers.

## COMMERCIAL FINANCE

**A New Trust Company, Tientsin.**—General Li Yuan-hung, ex-president of the republic of China, is organizing the Hua Chen Trust Co.





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in Tientsin with a capital of \$10,000,000, whose object it is to transact industrial loans to individuals and government.

**Chinese Banking.**—Soochow bankers are organizing a Bankers' Association, reports the bureau of economic information. The branch managers of the Soochow Bank, Shanghai Commercial & Savings Bank, Bank of China, Bank of Communications, Continental Bank, Kiangsu Bank, Wah Foo Commercial Bank, Hui Shang Bank, Hwei Hai Industrial Bank, among others, are the promoters.

The Industrial Bank of China's new branch at Ningpo reports that the opening deposits amounted to \$2,800,000.

In compliance with the order of the provincial government, the local gentry and the public fund and property bureau of Shanghai have jointly proposed the establishment of the Shanghai Agricultural & Industrial Bank. The capital is fixed at \$400,000, two-thirds of which has already been subscribed. A meeting of directors is to be called to location of the bank and to make necessary arrangements for registration.

The Nan Hwei Agricultural & Industrial Bank will shortly be established with a capital of \$100,000. Half of that amount has already been subscribed, and subscriptions are still being received. The inauguration is expected to take place this September.

**Chinese and American Bank of Commerce to Have a Branch in Fukien.**—The Chinese and American Bank of Commerce is contemplating the establishment of a branch in Fukien.

**Plans for a Sericultural Bank in Japan.**—It is stated in the *Japan Chronicle* that a number of silk weavers of Japan have formulated a definite plan for the establishment of a sericultural bank. Inasmuch as the present government relief measures must necessarily be only temporary, it is believed that such a bank for the promotion of sericulture and weaving should be established for the permanent aid of the silk industry.

## GOVERNMENT FINANCE

**Reported American Loan.**—The *Shanghai Journal of Commerce* published a report to the effect that a leading banker has made a statement to the effect that an American firm has entered into an agreement with the Peking government for a loan \$5,000,000 at 85. The loan will bear interest at the rate of eight per cent. and the customs surplus will be used as security.

**Loan Against Telephone Exchange.**—The Kuo Wen News Agency learnt recently by a telegram from Hankow that Wu Pei-fu is believed to have proposed the mortgaging of the Telegraphs and Telephone Company of Hupeh to a "certain country" in return for which he would receive a loan of \$1,000,000, fifty per cent. of which is to be paid in advance.

**The Gold Yen in Kuantung.**—The gold standard question, complications of which have lasted six months, is reported to have been brought to a settlement. Forward bargains with valuation in gold were opened recently and are being smoothly carried on with many Chinese present at the market.

**Dutch Banking Interests, N.E.I.**—Several companies and corporations interested in banking and shipping in the Dutch Indies have founded a central council under the presidency of Dr. M. F. W. Treub, a former minister of finance, for the purpose of safeguarding their common interests.—*Reuter*.

**Loan for Fishing Industry.**—The commissioner of wine and tobacco for Chihli province, says the *Kuo Wen News Agency*, has proposed that a loan shall be made from the Japanese for \$15,000,000 on the fishing industry which shall be carried on jointly by Chinese and Japanese.

**The New Railway Loan, China.**—The ministry of communications announces that the 8 per cent. short term railway car purchasing loan, which

was approved by mandate on January 26, is open to subscription.—*Reuter*.

**Chinese Bonds and Loans.**—The bureau of economic information publishes the following notes regarding Chinese bond issues and notes.

The ministry of communications has issued short term bonds to the value of \$4,000,000 for the Peking-Hankow Railway. The conditions are as follow:

Interest, 8 per cent. per annum.

Price, 92.8.

Repayment of principal, 4½ years in nine instalments.

The subscription of the bonds began on August 16 and will end on September 30. An amount of \$100,000 will be retained from the receipts of the railway, and deposited at the following six banks: the Bank of Communications, the Kin Cheng Bank, the Salt Industrial Bank, the Continental Bank, the Sin Hwa Savings Bank and the Bank of China.

The denominations of the \$6,000,000 car loan bonds issued by the Chinese Bankers' Association are \$100, \$1,000 and \$10,000. The bonds are now on the market.

**A British Loan Signed.**—In 1919 the ministry of communications concluded a loan of \$2,000,000 which the Anglo-Chinese Syndicate for the purchase of rolling stock for the Canton-Hankow Railway, but the government stood to lose a considerable amount on the transaction through losses in commission and in exchange as affected by the European war and consequently the loan was insufficient to meet the requirement. Recently, it is officially reported that the ministry of communications has again signed a loan with the syndicate, under approval of a cabinet meeting, amounting to \$850,000 to be spent in purchasing adequate railway materials for the aforesaid line. The terms of the loan are said to include the following items:—

- (1) Amount of loan to be \$850,000.
- (2) Interest to be 8 per cent. per annum and to be paid semi-annually.
- (3) Repayment of principal to be made in monthly installments of \$150,000 each, beginning in January, 1922.
- (4) Commission to be 15 per cent.
- (5) The loan to be secured on the revenue surplus of the Peking-Mukden Railway after deduction of securities on other loans.

## FORESTRY

**Immense Supplies in Philippines.**—The Philippines have sufficient timber to provide for the needs of most of the Far East, according to Major-General Leonard Wood, who recently commented on the forest resources of the islands as follows:

"Few people appreciate the enormous resources of the islands in the way of lumber; much of it is lumber of the most valuable kind. In the Philippines there is lumber to take care of most of the lumber industry in the Far East; nearly 230,000,000 feet of it was cut in 1920, of which in the neighborhood of 15,000,000 feet was exported."

"In ordinary years there ought to be an enormous amount available for export. Now is the time to initiate those wise forestry measures which would insure the replacement of trees cut."—*Reuter*.

## GENERAL

**Plan to Open Commercial City Maturing.**—There is every reason to believe that the plan to open Chengchow, Honan, as a commercial port will soon be carried out, for the Honan provincial authorities and the ministries concerned in Peking are ready to support the undertaking. A survey of the place is being made and regulations governing the undertaking are being drawn up.

**\$1,000 Prize for Design of New Coinage.**—The Shanghai government mint are offering a prize of \$1,000 for the best design for the new coinage. The principal qualities that the design should embody are as follows:

1. The design shall be such as to enable every one to recognize at sight that the coin bearing it is of Chinese currency.
2. The design shall have some relation to Chinese history.
3. The design shall be permanent in nature.
4. The design shall be clear and neat.
5. The design shall be such as makes counterfeiting difficult.
6. The design shall be easily modelled.
7. The design shall be such as makes "scratching" difficult.
8. The design shall be enduring.

**New Companies Registered.**—According to report from Peking, the following corporations have been officially registered of late with the ministry of agriculture and commerce:—

Hua An Forestry Co., Kirin.  
Ching Pu Forestry Co., Kirin.  
Yue Fong Forestry Co., Kirin.  
Electric Light Plant, Lao-hu-kow, Hupeh.  
Foong Hua Needle Manufacturing Co.  
Mai Lee Chen Soap Manufacturing Co., Foochow.  
Sung Chang Wood-Sawing Co., Ltd., Wuhu.  
Wei-hsien Waterworks Co., Weihsien, Shantung.

## INDUSTRIAL

**New Yarn Company.**—Shen Lien-fang, former vice-chairman of the Chinese general chamber of commerce, has organized a new cotton yarn concern at a capital of \$2,000,000. The yearly output is estimated at about £8,000,000. In advocating for the development of the cotton yarn business Mr. Shen points out that Japan with a population of 60,000,000 has 4,000,000 spindles while China with a population of more than 400,000,000 has only 2,000,000 spindles.

**1921 Output of Philippine Hemp.**—This year's output of Manila hemp in the Philippines will be only 600,000 bales, a little less than 50 per cent. of normal production, according to statistical reports obtained from several sources. Production last April amounted to 52,572 bales only, as against an average production of 105,346 bales for the same month during the past five years. During the months of January, February, March and April, 1921, the output totaled 214,176 bales as against the average production of 386,925 bales for the same 4-month period in the past five years. It is estimated that at this rate of monthly production for the rest of 1921 the Philippines will yield only 600,000 bales of hemp.

**New Chemical Plant Starts at Haiphong.**—A large factory for the production of chemical products has just been constructed at Haiphong, French Indo-China, by the Societe Industrielle de Chine d'Extreme Orient.

The first products to be manufactured are caustic soda, chlorine, oxygen and chloride of lime. The soda will be produced by the electrolytic treatment of chloride of sodium.

The works cover a superficial area of 23 hectares (roughly, 10 acres), with 600 metres of wharves on the river and two jetties, and also possess an electric power station, lime kilns, sawmill and a cooorage.

Under normal working conditions three tons of soda will be produced daily.

The opening of these works meets the immediate requirements of those Indo-Chinese industries using soda, such as paper mills, glass works, etc.

The spinning and weaving mills will also depend upon these works for bleaching, and the oil mills also for oxygenation of oils.

On the other hand, it is also intended to manufacture sulphuric acid, carbide of calcium and artificial manures, which now have to be imported in large quantities for the coffee, tobacco and other cultivations.

**A Large Cotton Mill Under Projection, Shanghai.**—Mr. Koo Tung-chen, who has practised for several years in an American engineering works after graduating from a cotton spinning



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Paraffine Wax  
Tree Sprays  
Wood Preservatives

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college, U.S.A., and has much experience in cotton industry, has planned with Mr. Shun, a wealthy Chinese merchant, for organization of a large cotton spinning and weaving factory in Shanghai. The proposed mill will be equipped with 10,000 spindles and will have a capital of \$2,000,000, of which \$1,300,000 will be devoted to purchasing machinery. Its average annual output is estimated at about 20,000 bales of 40 pounds each and a profit of \$1,220,000 is expected to be netted yearly.

**The Kofa Aerated Water Co.**—Nine Chinese have organized the Kofa Aerated Water Co. in co-operation with the American Drug Co., according to the Chinese press. The capital of \$150,000 has been fully subscribed and a plant will be constructed at Ward Road, Shanghai. The machinery, the Chinese papers say, will be ordered from Germany.

**New Industrial Plant for Foochow.**—A new industrial plant has been established in Foochow for the tanning of leather and the manufacture of alcohol. The leather will be made by the most modern process. The alcohol will be produced from sweet potatoes and the process will yield a liquid 97 per cent. pure.

**Chemical Plant in the Far East.**—A large factory for the production of chemical products has just been constructed at Haiphong, French Indo-China, by the Societe Industrielle de Chimie d'Extreme Orient. The first products which will be manufactured are caustic soda, chlorine, oxygen and chloride of lime. The soda will be produced by the electrolytic treatment of chloride of sodium. The works cover a superficial area of 23 hectares, with 600 metres of wharves on the river and two jetties, and also possess an electric power station, lime kilns, sawmills and a cooperage. Under normal working conditions three tons of soda will be produced daily. The opening of these works meets the immediate requirements of those Indo-Chinese industries using soda, such as paper mills, glass works, etc. The spinning and weaving mills will also depend upon these works for bleaching, and the oil mills also for oxygenation of oils. On the other hand, it is also intended to manufacture sulphuric acid, carbide of calcium and more especially manufacture of artificial manures which have so far to be imported in large quantities for the coffee, tobacco and other cultivations.

**A New Factory, Works.**—Chinese capitalists in Peking have started a new printing works outside Chienmen with a capital of \$200,000 and plan to run a school for compositors in connection with it.

**A New Paste Factory, Shanghai.**—The formal opening of the six new factory of the Hing Wah Paste Manufacturing Co. will take place on Ferry Road some time next month. This company is one of the pioneer Chinese companies and has a capital of \$1,000,000.

**Debby Looms Installed.**—Mr. Thomas G. Wong has established at 699 Markham Road, the China A. B. C. Underwear Weaving Co., which boasts the first set of debby looms ever imported into China and which can be converted to the weaving of fancy work. The mill produces four different kinds of underwear: union suits, two-piece suits, athletic suits and Chinese under-dress in separate pieces. The daily output is about 3,000 pieces.

**Formal Opening of New Spinning Mill.**—The formal opening of the Hua Foong Cotton Spinning Mill, Ltd., will take place at Woosung from 10 a.m. to 4 p.m. on the 27th instant. Mr. C. C. Nieh, chairman of the Chinese general chamber of commerce, is president of the board of directors of the new mill, and Dr. C. T. Wang is managing-director.

**Model Spinning & Weaving Factory Proposed.**—With a view to encouraging spinning and weaving enterprise, the ministry of agriculture and commerce has decided the establishment of a spinning and weaving factory in Peking which is to be served as a model for similar mills throughout China; and a delegate to make arrangements for its organization has been appointed.

**Two New Factories in Yu-Yao, Chekiang.**—Messrs. Ling Ping-yao, Yao Chang-ching, Lee Kao-sung and Chu Shao-chien are organizing a silk filature to be known as Tze Dah with a capital of \$2,000,000 in the city, and Mr. Wu Shao-ching is establishing the Yih Lee Cotton Mill at Lo-chia-teng in the eastern district of the city.

**Varnish Manufacturing Co. Under Organization, Tientsin.**—It is reported that the Dah Shen Varnish Manufacturing Co. is being organized by Mr. King Yuan-sung at Tong-kar-kew, Tientsin.

**Shun Hua Co. to have Branch in Peking.**—It is reported that a branch office of the Shun Hua Paste Co., Shanghai, will be established in Peking.

**A New Japanese Cotton Mill Under Organization, Mukden.**—The Japanese Cotton Spinning and Weaving Factory, which has been in the course of construction at Mukden, has increased its capital from Y.4,000,000 to Y.5,000,000, and is to be equipped with 20,000 spindles instead of 10,000 as originally announced. Machinery and factory equipment have been supplied by an American firm and work will commence in July, 1922.

**A Large Confectionery Establishment Will be Formed in Soochow.**—Mr. Chu Sung-yen, an experienced confectioner, has collected a sum of \$10,000 to form a confectionery at Kwei-chien Street, Soochow.

**A New Cotton Mill in Nantungchow.**—Messrs. Liu Tung-yi and Sung Chin-jen are planning the organization of a cotton spinning mill with a capital of \$400,000 at Kiu-hua-shan in San-lo-shang, Nantungchow.



**A Hair-Net Factory Established, Hsuehchow.**—Chinese hair-nets have formed a part of China's export trade in value amounting to \$20,000,000 yearly. In Hsuehchow, there has been established a factory to knit hair-nets. The factory has been organized by Mr. Lee Yi-sun, and registration has been made with the industrial bureau, Nanking.

**A Paper Mill Under Contemplation.**—Messrs. Yuan Ting-hung and Chang Hung-tien are planning the establishment of a modern paper mill at Chan-pai-jao, Yueyao, a paper-producing place in Chekiang. The factory, operated by modern machinery, is to be known as Hung Dah Paper-making Improvement Factory, as the promoters have intended to improve the paper-making industry of which the city used to be so proud before the import of foreign papers.

**Industrial Factory, Chekiang.**—With a view to developing industry at Chong-shih-chin in Hsiang-shan-hsien, Chekiang, which has always been a large commercial centre in the interior, Mr. Chu Sin-shan, a wealthy merchant, has planned the organization of an industrial factory at that place. The factory is to be divided into ten manufacturing departments—indigo, paper, drapery, soap, towel, hosiery, carpentry, gold and silver smiths, dyestuff and machinery—and work is expected to begin in September.

**A Chinese Tobacco Co. Proposed.**—Mr. Wang Sui-kai, director of the tobacco taxation bureau, is proposing to establish the China Tobacco Co. in Shanghai to compete with foreign factories. It is reported that the new company is to be run under the management of Chinese officials and merchants.

**An Oil Mill Under Organization, Shantung.**—Mr. Chang Kung-li, a merchant of Zee-hu, Shantung, is organizing an oil mill with a capital of \$80,000 at Pic-pei-tze in Lihchen, Shantung, to squeeze oil out of sesame and peanut,

which are some of the principal exports of Shantung.

**A Flour Mill Under Organization, Tsinan.**—Mr. Chang Tsan-jen is establishing the Hua Ching Flour Mill at Tsinan, Shantung, with a capital of \$400,000, half paid-up, and the new organization has been officially registered with the ministry of agriculture and commerce.

**Glass Factory in Shantung.**—Mr. Yeh Kung-cho, high industrial commissioner of China, has submitted to the ministry of agriculture and commerce for approval a set of regulations for the resumption of business of the glass factory at Pao-shan, Shantung, which suspended business sometime ago.

## MINING

**Tin Deposits in Kuangsi.**—Rich deposits of tin are being worked in the region of Hoyuan, in Kuangsi. Another tin mine has just been opened and a tin smelting works established.

**A New Coal Mine, Fengtien.**—Under approval of the ministry of agriculture and commerce, Mr. Chang Pao-yung, a wealthy merchant of Mukden, has collected the sum of \$100,000 to operate the coal mine at Dah-pai-ling-tze in Pang-chee-hsien, Fengtien. The property is said to cover an area of over 1,000 *mow*.

**Silver Mine Discovered, Wenchow.**—A silver mine has been recently discovered at Yue-kong-shan in Yung-chia-hsien, Chekiang, by Mr. Shun Hua-kwei, a returned student from Japan, who has applied to local authorities for permission to operate it.

**The Changhsin Coal Mine.**—A coal mine has recently been opened on a modern scale in the famous Huchow district. The mining area measures 40 square *li*. Two seams of coal have been opened up. The first seam is about five feet in thickness

and the second eight feet. The coal is of the anthracite variety and is said to be excellent.

**A Gold Mine Discovered, Shantung.**—A gold mine covering an area of hundreds of square feet has been lately discovered at Hsu-char-ling in Lai-foo, Shantung, and Messrs. Chao Yung-nien and Chang Kwei-yuan, local gentry, have raised a fund of \$20,000 to undertake its development.

**Soapstone Mine will be Worked, Fengtien.**—Mr. Wang Mow-shun has been permitted by the industrial commissioner at Fengtien to operate the soapstone mine recently discovered at Nan-shih-mu-kur in Hai-chen-hsien, Fengtien. A capital of \$20,000 has been raised for the undertaking.

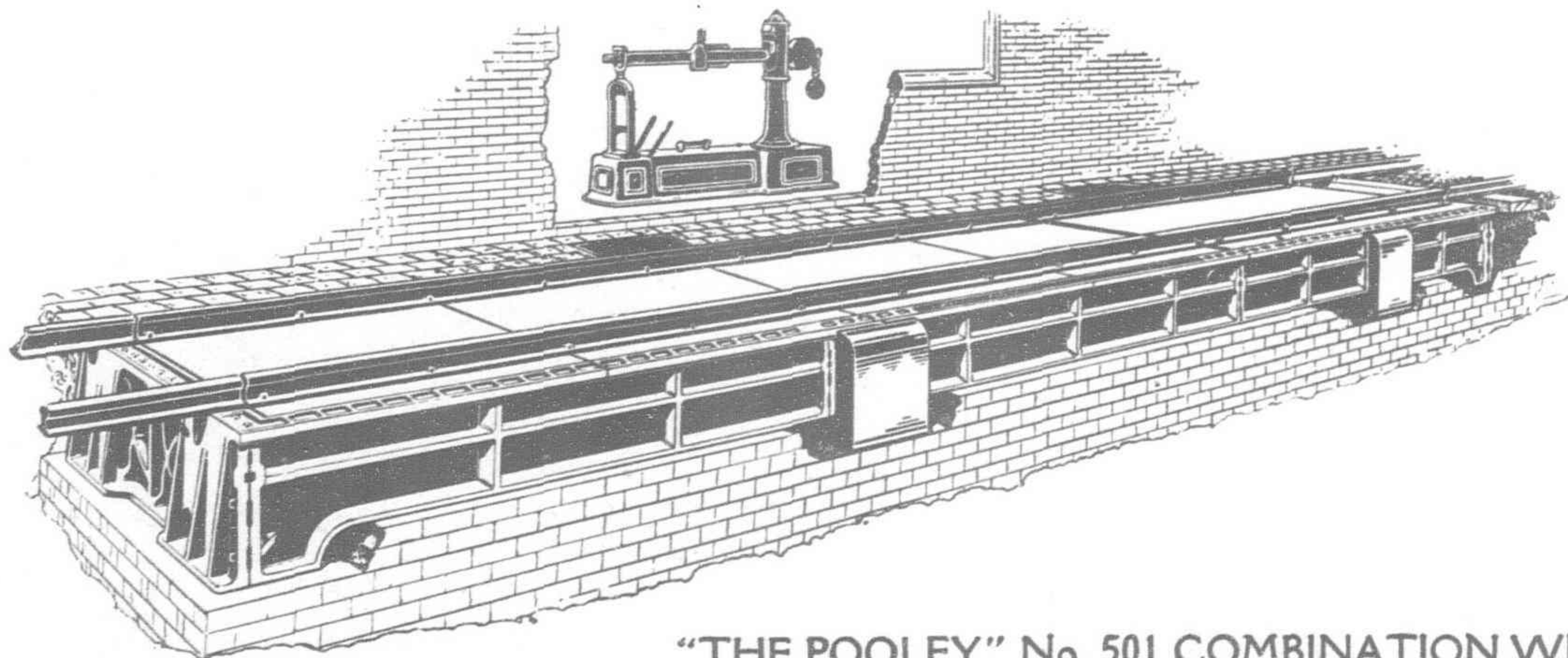
**Coal Mine to be Operated, Fengtien.**—Mr. Liu Nu-feng has been authorized by the industrial commissioner at Mukden to open the coal mine extending over 800 *mow* in area at Dah-song-hsue-tze in Si-foong-hsien, Fengtien.

**Pao-Yuan Coal Mining Co. Extending Its Working Area.**—A track of land covering about 100 *mow* has been silted up through the flood during the last year on the east of the mineral area possessed by the Pao-Yuan Coal Mining Co. at Tse-wu-tung in Fu-shun-hsien, Fengtien, and the said company has applied to the local industrial commissioner for the ownership of the new land.

**New Mining Regulations: Java.**—A copy of the new regulations relating to the prospecting for and mining of minerals under the Netherland East India Mining Law, which came into force on 1st July, has been received from H.M. minister at the Hague. The new regulations cancel previous ones of the above nature and state that the government has no objection to the establishment of mining enterprises in those regions which hitherto have not been regarded as being open to general mining. From 1st July applications for prospecting licences may be made for such regions.

# POOLEY

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**Development of Copper Resources: Netherlands Indies.**—H.M. consul-general at Batavia reports in the *Board of Trade Journal*: Since the discovery of rich copper deposits near Tanin, in South Timor (see the *Journal*, of 25th March, 1920, page 442), extensive exploring and developing work has been carried out by the Dutch government geological department, and, judging by the quantity of miscellaneous machinery and hand tools that have recently arrived at the mine, and the number of whites engaged, the deposits are assuming some importance.

It has been reported that in the neighboring district tin has been discovered equal in richness to anything yet found on the Island of Banka. Should this be the case it will lead to important developments in Timor, and it is advisable that the future working of these mines should be watched with a view of United Kingdom firms supplying the necessary plant and machinery.

"It has been reported that in the neighboring district tin has been discovered equal in richness to anything yet found on the Island of Banka. Should this be the case it will lead to important developments in Timor."

**Japanese Opening Shantung Coal Mine.**—Some Japanese interests have associated themselves with the Shantung officials for the organization of a coal mining company to develop the mineral wealth at Nan-ting-chen in Tze-chuen-hsien, Shantung. The property covers an area of over 600 square li and the coal deposit extends 7-ft. 5-in. in width. Twenty-four parallel seams have been proved and the deposit is said to be sufficient for supplying the whole province of Shantung with fuel. The new company is capitalized at \$6,000,000, of which the Japanese have provided \$3,000,000 and the rest is to be subscribed by Chinese officials.

**New Coal Mine to Operate.**—The industrial commissioner at Mukden has permitted Mr. Li Pai-chu to open the coal mine at Shar-kar-wai-tze in Nee-hsien, Fengtien, which covers an area of over 900 mow. A capital of \$70,000 has been raised by Mr. Li to undertake the enterprise.

**Operation of Mineral Resources Granted.**—According to latest reports, the ministry of agriculture and commerce has permitted the following concerns to operate as mentioned:—

Liu Ching-sun to open a coal mine at Shih-hu-chen in Liu-hu-pai, Fengtien.

Wu Cho-kan to open a coal mine at Yang-lutung in Nih-hsien, Fengtien.

Ma Tze-jao to open a coal mine at Sun-dee-shan in Fu-kao-ching of Taiyuanfu, Shansi.

Wu Chung-hsu to open a lead mine at Ma-der-shan in Hsu-chang, Chekiang.

Wang Yao to open a coal mine at Si-kao-kiu in Yang-l-kiu, Chihli.

Shiao Yu-ying to open a coal mine at Si-kiu in Wong-shan and at Lung-shai-kaio in Wai-ping, Chihli.

Chen Sheng-pao to open a coal mine at Dah-lu-shur-kiu in Tung-hua, Fengtien.

Shu Chen-deng to open a coal mine at Feng-ma-kiu in Yee-tung.

#### 100,000 Tons Iron Ore from Johore to Japan.

—The other day, a Weltevreden correspondent asked whether it is true that 5,000 tons of iron ore is being shipped monthly from Johore to Japan. Another correspondent says he does not know the quantity but export does take place, the ship lying outside, near Pengarang and after loading she sails direct for Japan.

Another correspondent states that the Nanyo Ironworks (Japan) has a concession from the Johore government to work the ore at Batu Pahat.

The Mitsui Bussan Kaisha have a contract to

ship 100,000 tons this year to Japan. No doubt details of this new industry will be given officially in due course.—*Straits Times*.

## OIL

### Petroleum Production in Japan and America.

—The output of petroleum in America is reported to be steadily on the increase and the amount turned out during 1920 indicated a gain of about 20 per cent. as against the preceding year. The annual production of petroleum in America now represents 14 per cent. of the total world production, while the output of the same in Japan is decreasing year by year since 1916, when a record output of 2,643,175 koku was obtained. The amount of petroleum turned out in Japan during the past six years in comparison with that of America is as follows:

	Output in Japan koku	Output in America koku
1915	2,613,281	281,104,104
1916	2,643,175	300,767,258
1917	2,600,207	355,927,716
1918	1,230,253	355,927,716
1919	2,070,296	377,719,000
1920	2,087,001	443,402,610

**Vegetable Oil as Fuel, East Indies.**—The possibility of using vegetable oils as fuel has often been considered, and among the oils tested in recent years are castor oil, ground-nut oil, and palm oil. The two former have not proved very satisfactory, and ground-nut oil, in any case, would be too expensive; but in the case of palm oil the tests carried out recently have given very promising results. Obviously, it would be a great advantage to be able to use vegetable oils, for the supply of these is continuous or perennial, differing fundamentally in this respect from a mineral like coal or petroleum. Enormous supplies of palm oil are available in West Africa, and the supply in that part of the world alone could be made practically unlimited, to say nothing of the great extensions of oil palm cultivation to other parts of the world, notably the East Indies. Tests with this oil as a fuel were first begun in 1914 and resumed again after the war by a Belgian company the Omnium Africain—since amalgamated with La Compagnie Generale du Congo. It has a total capital of 20,000,000 fr. and its chairman is M. Renkin, the late Belgian colonial minister. A large English firm is also interested in the same problem, and has carried out some tests in the Congo which have proved very satisfactory so far. Both companies are largely interested in the oil palm industry, and the production of palm oil and palm kernels, and were not slow to realize the great economic importance of being able to use palm oil, especially low-grade unrefined palm oil, as an engine fuel. The matter is of particular importance in the Congo and other parts of the tropics, where fuel, both for industrial purposes and also for river navigation is extremely costly. The new fuel should be of the utmost value in the development of tropical industries. The engine-running tests were carried out in Brussels with an 8 h.p. Swedish engine, the Drott, which is a two-cycle semi-Diesel engine of simple design and strong construction. Palm oil is not entirely liquid at ordinary temperatures, so that it is necessary to have a specially heated feed tank for keeping the oil in a perfectly liquid state; and for the same reason it has so far been found necessary to begin and end the run with ordinary petrol. A small petrol tank is therefore provided in addition to the palm oil tank. It was found that low-grade unrefined palm oil containing a comparatively high percentage of free fatty acids could be used, the fatty acids being almost completely burnt, and there was no corrosion. This principally in British hands, the demand being supplied by the United Kingdom to the extent of 54 per cent., Penang and Singapore supplying 25 per cent. and Australia 10 per cent. 1918 saw no import from Great Britain whilst the British colonies supplied but a small quantity. On the other hand the United States which in 1913 were

still excluded from this trade, supplied 90 per cent. in 1918 and 73 per cent. in 1919 of the total import into Java and Madura. The import statistics for the year 1920 show that Holland and Great Britain have once more conquered part of this trade, but this does not alter the fact that the greater part of the demand is supplied by the United States.

**Imports of Oil: Japan.**—According to a report to hand, Japan imported during the first four months of this year oils amounting to 236,500 gallons valued at Y.1,875,015. The details are as follows:

	Volume gallon	Value Yen
Crude oil	17,541	47,406
Naptha	78,999	791,430
Illuminating oil in cans	4,000	39,600
Illuminating oil not in cans	89,767	484,120
Mineral oil	460,191	512,459
Total	236,500	1,875,015

## RAILWAYS

**Receipts of State Railways, Japan.**—According to official returns, the income from state railways during July last totalled Y.29,970,525, a gain of Y.4,138,210 as against the corresponding month of last year. The total receipts during the first three months of the current financial year beginning with April stood at Y.126,565,491, an increase of Y.10,669,246 as compared with the same period of last year, the average receipt per day per mile being Y.147.23. The details are as follows:

	July	April-July
Passengers carried	32,270,066	153,098,851
Freight carried (tons)	4,228,635	17,184,249
Receipts from passengers	16,813,607	72,895,074
Receipts from freight	13,156,918	53,670,417
Total receipts (yen)	29,970,525	126,565,491

**A New Railway in Fengtien Planned.**—General Chang Tso-ling, inspector-general of Manchuria, has formulated a plan for building a light railway in the north-eastern part of the province of Fengtien. It is said that the government is ready to set aside \$5,000,000 for the purpose, and that another \$5,000,000 will be subscribed by the Chinese community in Fengtien.

**Tokyo Subway Construction.**—The proposed construction of a subway in the city of Tokyo has received much publicity in the Japanese newspapers during the past six months, writes Trade Commissioner H. A. Butts. Some of these news items have made it appear that it was only a matter of a few months before actual construction would be begun. One paper stated that at a regular of shareholders of the Tokyo Subway Co. held recently it was announced by officials that the geological surveying or experimental boring that is now being conducted along the proposed trunk line would be finished within this year and that in 1922 actual work would be started with the intention of finishing the trunk line by 1924. According to Mr. Butts the preliminary work thus far accomplished has given the construction company cause for optimism, as the subsoil has been found to be clay and sand, a favorable base. Representatives of the company have been sent to New York for a personal study of construction work. They are favorably inclined toward American machinery and will, so far as possible, limit their purchases to American products. It would therefore seem that American manufacturers of every sort of subway or tunnel-making machinery should consider the Tokyo subway as a possibility to be developed within the next two or three years.

**Tenders Invited.**—The Chinese Eastern Railway Administration invites tenders for the supply of 450 tons sheet iron roofing, also for a number of door and window accessories.



**Inauguration of Chenkartung-Beiyuantailai Railway.**—According to report, one-third of the construction work on the new line from Chenkartung to Beiyuantailai, Fengtien, has been fully completed, the remaining work having been carried on steadily. Being anxious to give facilities to communications at an early date, the railway authorities have decided to open to traffic the section already finished sometime in September.

**Possible Loan of Y.25,000,000 by The Chinese Eastern Railway Reported.**—Mr. Hayakawa, president of the S.M.R. Company, is inclined to loan twenty-five million yen to the Chinese Eastern Railway Co.

**Coal Mining Co. Building Light Railway.**—Chang Shun Coal Mining Co., Shanghai, established in 1913 with a capital of \$2,200,000, has its mineral property at Sze-mow-tung in Huh-chee-shang of Chang-shun-hsien, Chekiang. The mine covers an area of more than 40 square *li* and up to now two seams have been proved with a depth of from 4-ft. 5-in. to 5-ft. and 7-ft. 5-in. to 8-ft. respectively. As estimated by mining engineers, its output—excellent bituminous coal—will be increased year after year and the supply is not likely to be exhausted within one hundred years.

The company, however, has experienced much difficulty in transportation of coal to the distributing centre, the mine being located in a deserted region. As a means to overcome the difficulty, it has been decided at its last committee meeting that a light railway will be built from the mineral district to Wu-li-jao, a distance of 50 *li*. According to estimate, the construction of the railway will call for an expenditure of \$500,000, and rolling stock and other equipment will cost at \$300,000. Work is reported to have already started.

**New Supply to Peking-Mukden Railway.**—As soon as approved by the ministry of communications, the Peking-Mukden Railway Administration will place an order with Mitsui Bussan Kaisha for supply of 25,000 rail sleepers, 2,420 side-track sleepers and 7,500 bridge sleepers.

**Passenger Car to be Equipped with Machine Guns.**—As a protest against robbery of trains by brigands, which repeatedly occur along the Tientsin-Pukow line it is reported that the communication authorities are contemplating to put two machine guns and police on every train.

**Immediate Construction of Shaoshing-Shoshan Railway Requested.**—Mr. Chen Liang-shih, a native of Chekiang, has submitted a petition to the ministry of communications, requesting to carry out the construction work of Shaoshing-Shoshan Railway, Chekiang, which was planned to be built years ago and has been suspended on account of financial shortness.

**Prospect of Tube Railway for Calcutta.**—The *Englishman* understands that Mr. Ogilvie, who had been deputed by Mr. Dalrymple Hay for the government to make an enquiry into the possibility of having tube railways in Calcutta, has now completed his survey and left India for home. His report is to be issued shortly. It is understood that from an engineering point of view it is quite feasible to have tube railways in Calcutta. The only consideration now is a financial one, whether the initial sum of money needed in order to inaugurate the service can be raised. The project is not a municipal one, but is in the hands of government. Mr. Ogilvie's survey was for the purpose of collecting data locally regarding the soil, temperature, prices, depth of the Hughli, possible routes, connections with railways and tramways and sites for stations.

**The Light Railway Along the Yalu River.**—The civil governor of Fengtien has instructed the Taoyin of the eastern prefecture of Fengtien to make preparations for the construction of the proposed light railway along the Yalu River. The work is estimated at \$10,000,000, one half of which is to be subscribed by the offi-

cials while the other half is to be subscribed by the citizens.

**Signal Station on Peking-Suiyuan Railway.**—It is reported that the Peking-Suiyuan Railway is planning to establish a signal station at Ning-yuan at an estimated cost of about \$46,300.

**Inauguration of Peking-Suiyuan Railway.**—On September 19 there will be observed at Suiyuan the inauguration ceremony of the Peking-Suiyuan Railway which was opened to traffic last May. This railway, whose main line measures 1,213 *li* with a branch line of 122 *li* was constructed exclusively by Chinese and purely out of Chinese money.

**Szepingchar-Taonan Railway.**—About eight-tenths of the Chencharteng-Peiyingtailai section, which measures 72 miles, on the Szepingchar-Taonan Railway has been fully completed; and service from Chencharteng to Dahling will commence on November 1, 1921, while the section from Dahling to Peiyingtailai via Men-lien-ying and Pa-si will probably be opened to traffic at the end of the year. The building of remaining section from Peiyingtailai to Taonan measuring 140 miles on this long-projected Szepingchar-Taonan Railway will be continued next year.

**Railway College Proposed by Warlord Chang.**—Gen. Chang Tso-lin, inspector-general of the eastern three provinces, has decided to establish a railway college somewhere in Manchuria for educating railway experts for the service of the Chinese Eastern Railway.

**Peking-Suiyuan Railway to be Extended to Ningsia.**—The ministry of foreign affairs has suggested to the ministry of communications, that, owing to the absence of communications in north-west China, progress in the construction of the north-western railway should be made as soon as possible. It is reported that the ministry of communications has received his suggestion favorably, and is now considering a plan for the extension of the Peking-Suiyuan Railway from Suiyuan to Ningsia.

**S.-N. Railway Building Side-Tracks at Nanking and Woosung.**—In order to meet the increasing demand of transportation service by the Chang Shun Coal Mining Co., which has recently obtained a new mining concession. The Shanghai-Nanking Railway Administration has decided to build side-tracks at Nanking and Woosung and accommodate a designated lot of land for storing of coal upon rent, and also to build a wharf at Nanking and one at Woosung at an estimated cost of \$65,000 and \$60,00 each. When these facilities are completed, an increase of \$250,000 for freightage on transport of company's coal can possibly be made every year.

**1921 Railway-Building Program Progressing: Japan.**—Railway construction in Japan is announced by the department of railways to be going on satisfactorily. The present financial year's program includes the laying of new lines, 260.8 miles in length, of which 104.7 miles have already been laid and are open to traffic.

The present financial year's construction program includes no trunk lines, and in the scale of importance it stands lower than the repair or improvement plan. But the mileage of the new lines to be laid is pretty large totaling 260.8 miles. According to an announcement made recently by railway authorities, the construction thus far has been up to expectations.

Very shortly two more sections will be completed, the total mileage being 23.6 miles. One of these is the Hamada-Namiko section of the Hamada Line in Fukui prefecture. This line will be completed soon. The other is the last section of the Ono Line, 14.5 miles in length. It will be opened to traffic about September 11.

The rest which are still in construction are 16 lines or sections, 132.5 miles. The department of railways plans to complete them by next March.

**Big Order of Steel Rails for a British Firm.**—Messrs. Baldwins, Limited, have secured an order for 17,000 tons of steel rails for China.—*Reuter.*

**Replacement of Rails on S. M. R. Co. Line.**—Referring to the replacement of rails and the double-tracking work on the main line of the S. M. R. Co. Manchuria Lines, Mr. J. Fujine (superintendent, the railway office) says to the following effect:—

At present the rails of the S. M. R. Co. Manchuria Lines consist of 180 miles of 100-lb., about 700 miles of 80-lb., and some 600 miles of 64-lb. It is on the cards that a section covering 180 miles shall have its rails replaced with 100 pounders. The rails ordered from abroad indirectly are arriving in succession. The price of rails is about Y.130 per ton, costing about Y.20,000 per mile in rails alone. There was, however, a time when 1 ton of rails cost Y.200.

The durability of rails varies according to the quality of rails and the locality in which the rails are laid. But in the present condition of the S.M.R. Co. Manchuria Lines, it may be safely put at 60 years. This refers to the main line, on which the heaviest traffic is carried on. The old rails are available for constructing sidings in some railway station yards.

As regards sleepers, Hokkaido timber has been in extensive use hitherto. Lately Kirin timber has come to be also used. The durability is about six years.

The Railway Company maintains a timber creosoting plant at Suchiatun south of Mukden, where the creosote obtained from the dregs left after extracting coal tar at Fushun Collieries is applied to the timber as preservative. By this means, the durability of the timber can be extended to about fifteen years.

In the present fiscal year, the work of doubling the track north of Tiehling up to Kaiyuan will be taken up.

**A Railway System.**—The Cantonese government has under consideration the question of linking up, by railways, the two frontier provinces included in the south-west federation, which is now a reality in name and in fact since the fall of Nanning. It is intended to construct a great trunk-line from Canton to Chungking in Szechuan and another from Canton to Yunnanfu, the capital of Yunnan. The most difficult section of the latter line has been surveyed, i.e., the section from Yunnan to Kuangsi, the rest of the line following level ground. Besides the construction of these trunk routes, there is good reason to hope that the completion of the Canton-Hankow railway will soon be taken in hand.

The construction and operation of these three trunk roads will, it is expected, transform Canton and make it one of the greatest trading centres in the world. The Canton-Chungking railway, for instance, will tap the biggest and richest province of China with an area as large as Germany and a population equal to the combined population of France and England, and resources that are truly continental in scale. And it may be noted that for the present and for many years to come, Hongkong must be the ocean port of Canton.

**Order for Steel Rails.**—The Peking government has ordered from the United States Steel Products Company 17,000 tons of steel rails for the Peking-Suiyuan Railway.

**British Offer Loan to Help China Buy Railway Rolling Stock.**—The ministry of communications has submitted a proposal to contract a short-term loan with the British-Chinese Corporation for the purchase of rolling-stock for the Hunan-Hupoh section of the Szechuen, Canton and Hankow Railway. It is understood that this suggestion has been favorably received.

**Military Governor of Heilungkiang to Build a Railway.**—As the opening of Ma-kar-zai-kow, north of the Sungari river, as a commercial port, will certainly enhance its industry and commerce, the tuchun of Heilungkiang intends to raise a fund of \$4,000,000 from the public works department for the construction of a railway from Harbin to Heilungkiang.



**Construction of Light Railway Affected by Flood.**—As a result of the flood at Hu-chow, Kiangsu, the construction work of the light railway from Hai-chee to Wu-lee-jao, Huchow, has been suspended, a lot of rails and sleepers having been destroyed. The railway is being built for the Chang Shun Coal Mining Co. at an estimate cost of about \$90,000.

**Chinese Eastern Railway and South Manchuria Railway May be United in Transportation Service.**—According to reports, negotiations are proceeding between the Chinese Eastern Railway and the South Manchuria Railway for through transportation service. The proposal is said to be mutually agreed upon by both parties and Mr. Sung Sho-lien, director of Chinese Eastern Railway, has recently made a report to the government regarding the result of the negotiations.

**A Further Purchase of Cars.**—There is another contract concluded between the Railway Car Loan Chinese Banking Group and the Fearon, Daniel Co. for the supply of 40 40-metric ton all steel covered wagons for the Shanghai-Hangchow-Ningpo Railway. The text reads the same as the former one for the Tientsin-Pukow Railway, only with the following alterations:—

Wagons 40 in number at the price of B.F. 32,260 per complete wagon, for goods delivered c.i.f. Woosung, excluding customs duty and all other dues.

The Railway administration's inspecting engineer is Mr. Palai.

**Prolongation of Light Railway, Nantungchow.**—With reference to the lengthening of the light railway owned by Dah Sung Cotton Mill, Nantungchow, work has been commenced. When completed the whole line will measure 13 *li* in length and will reach Tsing-lung-kong direct from the cotton mills.

**Improvement Work on Peking-Mukden Railway.**—The Peking-Mukden Railway brings in yearly an average net profit of over \$10,000,000 which stands first among the government railways, and improvement work on it is carried out almost all the time. While the extension work from Sze-tao to Jehol is still under way, another scheme for double tracking a distance of about 30 *li* starting from Ching-chow is under contemplation.

**New Work on Tientsin-Pukow Railway Approved.**—The proposal of the Tientsin-Pukow Railway Administration for enlarging the No. 1, 2 and 4 railway warehouses at Pukow to be covered with strong roofs at an estimated cost of \$50,000 has received approval of the ministry of communications.

The railway administration has also been permitted by the chiaotungpu to purchase 1,500 tons of pitch to coat the sleepers for preservation.

**A Chinese Railway Sleeper Factory.**—Most of the railway sleepers on Chinese railways are imported from abroad and an enormous amount for this has gone to foreigners' hands every year. The ministry of communications has raised a fund for the establishment of the Government Railway Sleepers Factory.

**Materials for Szechuen Railway Ordered from Shanghai.**—Mr. Wang, representative of the Tze-lu-ting-Foochen Railway, Szechuen, under protection, has lately come to Shanghai for the purchase of a lot of railway materials from the Tsin Chang Engineering Works.

## PUBLIC WORKS

**Public Works, Nantungchow.**—The removal of Nantungchow city walls is approaching completion and the construction department is ready to build a market on the old foundations and to construct some modern roads inside the city which will

necessitate pulling down some old buildings which prove to be an obstruction to carrying out the scheme.

## RIVERS, HARBORS, WHARVES AND DOCKS

**New Pier for Hongkong.**—Tenders are being called for the construction of a reinforced concrete public pier, 160 feet 8 inches long by 41 feet 4 inches wide, and approach, at Queen's Statue Square, Hongkong.

**Preparatory Offices for Haichow Harbor Works, Kiangsu.**—It has been decided that pending the establishment of Haichow Harbor Works Office which will be appointed when survey of the port and other preliminary arrangements have been completed, a preparatory office will be organized at Nanking to take charge of preparatory works of the scheme.

**Kiang-Ngan to be Opened as a Commercial Port.**—The construction of Kiang-ngan as a commercial port near Hankow, Hupeh, has been decided to be taken up by the ministry of communications, and survey and investigation of the port is being carried on by engineers. Six hundred *mow* of land will be reserved for constructing modern roads and building a new market.

**Plant for the Han-Yeh-Ping Co.**—Designs of coal handling plant which has been built by Messrs. Horace Greaves & Co., Ltd., of Derby, for discharging boats at the staith on the Yangtze River, and delivering coal to the bunkers at the coke ovens, the boilers, and other parts of the works have been examined recently. The task set the designers was far from easy. The plant when fully loaded was to be capable of handling 200 tons of washed slack per hour in discharging boats from the River, has a difference in water level between the wet and dry seasons of no less than 40 feet. The plan of unloading by grab had to be discarded because the washed slack, although drained, would contain sufficient moisture to make it plastic. This would mean that the grab to be of service would have to be dropped into the material, which might well result in damaged grab or boats. The way out of the difficulty was found by a specially-designed dredger working in conjunction with a system of conveyers. The plant is a fine piece of constructional work, the mechanical portion being equally sound alike in conception and disposition.

**Hsiang-Shan to Build a Wharf.**—With a view to affording facilities to the steamers frequenting Hsiang-shan, Chekiang, Mr. Hus Ming-jen, with the support of the local magistrate Mr. Li Bai-tser, has formulated a plan for the building of a wharf at Bei-tung. The expenditure is estimated at something like \$10,000, and solicitation of subscription among the public for the purpose has been begun.

## ROADS

**Chefoo-Weihsien Road.**—The work on this road was started on September first of last year and will be finished shortly. Within a period of eleven months approximately 3,000 refugees have been given employment and a total mileage of 650 has been completed. The total expenditure of famine relief funds has been \$850,000. The road for motor transportation purposes is to be divided in twenty sections, each section having a station, and the stations being separated into three classes. The expense of establishing the stations and purchasing the necessary equipment is estimated at \$600,000.

**Proposal of Anhwei-Chekiang Automobile Road.**—With a view to facilitating communications and improving means of transportation, Mr. Wu Tien-ching and several others have proposed the con-

struction of the Anhwei-Chekiang Automobile Road. In Chekiang the terminus of the line will be at Yuehong and its Anhwei terminus at Teng-chee, and the whole line, when completed, will measure about 300 *li*. A survey has been made.

**An Automobile Transportation Co. in Southern Fukien.**—Several Fukien officials have associated themselves with the local gentry and merchants for planning the organization of Sze Shun Automobile Transportation Co. to run a service on the newly-built provincial roads and also on roads being built and to be built. At the outset, Chong-chow will be chosen as the central station, leading to Shih-mar on the south-east, a distance of 35 *li*; to Tien-pao-hsu on the north-east and turning westward to Nan-zing-chen, 35 *li*, and to Nan-hsu on the north then turning eastward to Chang-tai-chen, 30 *li*, aggregating 100 *li* in length. Transportation service from Chong-chow to Mar-kow-jao via Feng-jen-mue, a distance of 35 *li* and from Feng-jen-mue to Chenchee, 10 *li* is also under contemplation.

**Roads to be Well Paved, Tongshan.**—Neglect in public work has made Tongshan, Chihli, imperfect in some degree, though on the other hand the town has made remarkable progress in industry and commerce. With a view to improving the existing conditions, Mr. Liu Tze-tseng has decided to have the Tongshan roads well paved. The plan involves the construction of a line of 1,300,000 sq. ft. to cost \$10,000. Permission has been obtained from the provincial authorities and work will be carried out in the near future.

**Road Construction, Nantungchow.**—Except the recently built Museum Road, all the roads in the southern part of Nantungchow are in a bad condition and very narrow. In order to facilitate communications, the road construction department has commenced to have all the narrow paths macadamized and extended in width by 10 feet so as to afford enough space for running motor-cars.

**Haining-Changanchin Automobile Road, Chekiang.**—The automobile road from Haining to Changanchin, Chekiang, which measures 26 *li*, has been surveyed by Mr. Yue Shao-foo, the engineer. According to estimates, a profit of about \$50,000 can possibly be made every year from the autobus service to be run on the road.

**Road Construction, Hsuechow.**—While the two roads leading direct from the railway station of the Shanghai-Nanking line to Tung-men and Nan-men respectively in Hsuechow have been completed, the construction of the second and third roads, which have been under projection for some time, will be started soon, and the local magistrate has notified the public to that effect.

**Chekiang-Anhwei Automobile Road is being Surveyed.**—With reference to the construction of an automobile road from Chekiang to Anhwei via Hangchow, Yue-hong, Yue-chien, Chang-hua, Shih-hsien, Tsi-chee and Shu-ning, proposed by Mr. Wu Chang-yung, a prominent merchant of Shu-ning, Anhwei, the sanction of provincial authorities has been secured, and survey of the projected line is being carried on by Mr. Chong Lu with two assistant engineers.

**Woosung Military Road Planned.**—In order to facilitate military transport, Yung Dao-yih, a military officer in Woosung, has decided to construct a military road from the Bay of Woosung Fort to Sze-tze-ling, a distance of about 20 *li*.

**Plan of China National Roads Construction Society.**—Since its establishment the China national roads construction society is endeavoring to carry out the scheme for construction of Shanghai-Nanking-Hangchow motor-road. At request of Dr. C. T. Wang, chairman of the society, General Lu Yung-hsiang, tuchun of Chekiang, has consented to send a body of soldiers to render their services in building of Shanghai-Hangchow line, and the work is expected to start before long.



## SHIPBUILDING

**Slump in Shipbuilding, Japan.**—The shipbuilding industry is now apparently at its worst. The department of agriculture and commerce reports only five vessels of 1,000 gross tons or more launched in May. The Uchida Shipyard at Yokohama has been sold to the Osaka Iron Works which is in turn connected with the Osaka Shosen Kaisha. The yard has been closed except for the completion of one steamer now building. The future policy of the new company, to be named the Yokohama Iron Works, will be determined later. It is rumored that the Yokohama Dockyards will soon pass to the entire control of the Nippon Yusen Kaisha, which now owns a majority of the company stock.

Vessels tied up in Japan are slowly being released. The decrease thus far is in small ships used in the coasting and near-sea trade. In foreign trade there is a decrease in arrivals and departures. This decrease is especially noted in foreign shipping, particularly American, which has given way to Japanese lines.

**Launch of a Steel Motor Lighter.**—A steel single-screw motor-propelled lighter to carry about 200 tons deadweight and to have a speed of 9 knots, built to the order of Holt's Ocean Steamship Co., was launched from the Kiangnan dockyard recently.

The vessel is to be propelled by Campbell oil engines of 160 B.H.P., operating on kerosene oil.

This lighter is the first vessel of the type built for service in this harbor, where freight is usually loaded into barges and then towed to the point of discharge. The self-propelled lighter will no doubt gradually supersede the old method of transport of freight in and about this harbor and Woosung.

## SHIPPING

**Good Port for American Shipping.**—In a letter on American trade conditions in Indo-China Consul MacVitty states that Saigon is proving one of the surest cargo ports for American shipping in the East. There was recently more cargo there than could be handled by the present shipping facilities. Shipping agents say they can secure better rates at other ports, but it is believed that the rate question will shortly improve, and in that case Consul MacVitty thinks it would be worth while to allot a larger amount of shipping to Saigon.

**Orders for Three Steamers Placed with Local Docks.**—Tenge & Co., the Japanese steamship company of which Kaiyosha Co., 5 Canton Road, are agents, have placed orders with the Kiangnan and the Mitsubishi Docks for the construction of three steamers for the Ichang-Chungking run at a cost of about Tls. 1,200,000. The steamers will be launched in March and immediately put to service on the upper Yangtze.

Two of these steamers will be constructed by the Kiangnan Dock, while the other has been contracted for with the Mitsubishi. All the steamers will be of uniform size, each measuring 205 feet in length, 31 feet in breadth and 17 feet deep. The boats will each be capable of a speed of 15 knots and equipped with all modern conveniences.

**A New Undertaking in China.**—The plan of Mr. Woo Zao-chi, a returned student from France, for organizing the Chuen-Kiang Aerial Navigation Co. at Chungking has received favorable consideration and the approval of official circles as well as the business people of Szechuen. General Liu, commander-in-chief at Chungking, has promised to set aside an amount of \$150,000 for its reserve fund, and all the prominent and influential personages in Szechuen have participated in the undertaking, the most important being Messrs. Tang Tze-tsing, Li Yu-sung, Yuan Zung-wu, Li Tung-lung, Wang Yuan-sung, Kao Sur-tze and Li Bai-tze.

**A Navigation Co. Under Organization, Chekiang.**—Mr. Li Tsu-mai is organizing the Yah Tsi Steamship Navigation Co. at Ling-chao, Chekiang, and application for approval and registration has been made to the civil governor

of Chekiang who has in turn submitted the petition to the ministry of agriculture and commerce for consideration.

**Projected Steamship Service to Shanghai.**—The steamship service recently started between Dairen and Tientsin by the Tenkwa Yoko, a company organized by some prominent shipowners in Tokyo and Yokohama, is reported to have proved a success. Encouraged by this departure, the company is reported to have decided to open another service to Shanghai, which is now done exclusively by the N.Y.K., using the newly-built str. *Toko Maru* (2,100 tons), the *Toyo Maru* No. 3 (2,700 tons) and the *Kisen Maru* No. 3 (2,508 tons).

**Bigger Steamers Built this Year.**—Investigations made by the ministry of communications show that the number of steamships of 1,000 tons and above launched from dockyards in Japan during the first six months of this year is 27 with an aggregate tonnage of 14,420. To be more particular, six with an aggregate tonnage of 37,960 were built at the Kawasaki Dockyard, four of 24,540 tons at the Yokohama Dockyard Company, four more of 9,800 tons at the Sakurashima Dockyard of the Osaka Iron Works, two each at the Asano and the Mitsu Bishi Dockyards, and one each at the Ishikawashima and eight other dockyards.

**New Lighter Built at Kiangnan.**—A steel single-screw motor-propelled lighter to carry about 200 tons deadweight and to have a speed of 9 knots, built to the order of the Ocean Steamship Co., was launched from the Kiangnan dockyard on September 5.

The vessel is to be propelled by Campbell oil engines of 160 b.h.p., operating on kerosene oil.

This lighter is the first vessel of the type built for service in Shanghai harbor.

**Extensive Schemes Drawn up by Chinese Chamber of Commerce, Mukden.**—With regard to the proposed undertakings of navigation and fishery by the Chinese chamber of commerce at Mukden with a capital of \$15,000,000, it has been decided at its last meeting that \$10,000,000 will be devoted to the construction of twenty steamers to operate a service at Yinkow, Antung, Tientsin and Shantung, and another \$5,000,000 to purchase of some fishing steamers and organization of a fishery company to work at Yinkow, Antung, Fu-kan, Baisan, Kin-hsien and Wu-lu-tao.

## TELEPHONES

**A Telephone for Sale.**—There is an interesting dispute between the Chinese government telephone administration and a Mr. Wu, residing in the Tsung-pu Hutung, Peking, for the latter's selling of his telephone by advertisement in the vernacular journals. This man says that he will sell or transfer his telephone to the highest bidder without the permission of the telephone administration. This is believed to be the first case in the history of the Chinese telephone service though in Japan telephones have changed hands without official sanction. Owing to the lack of machines, many people who applied for telephone connections last year are still unable to get them.

## TRAMWAYS

**Chinese Ask Control of Peking Tramway.**—Consequent on the suspension of payment of the Banque Industrielle de Chine, which held the French shares, the board of directors of the Peking Tramway Company has petitioned the government to cancel the Sino-French agreement in connection with the formation of the organization, so that it may be converted into a purely Chinese enterprise.

The ministry of finance has appropriated \$500,000 for government shares so as to enable the work to continue without interruption. The ministry of foreign affairs is negotiating with the French authorities to secure the cancellation of the agreement.

**Tramway System, Fengtien.**—A plan has been formulated by Mr. Chiang Sze-shih for laying down tramway tracks in Fengtien in three different routes, viz: (1) from Mukden to Yinkow, (2) from Mukden to Dairen and (3) from Mukden to Fushun, and a petition together with a set of regulations has been submitted to the local authorities for approval and registration.

**Prospective Purchase of Singapore Tramways.**—Without considering the report of Mr. Dyson the expert from Rangoon, Singapore municipality will offer £190,000 sterling for the acquisition of the tramways, less the cost of putting the plant in good running order. Subject to verification, the stores are at present valued at £58,000. This is a final "take or leave" offer.

**Tramway System Proposed by Japanese, Antung.**—A plan has been on foot by Japanese capitalists for laying down a tramway track at Sin-tze-kar in Antung, Fengtien. The proposed line is to start from Dah-wu-jao, thence leading to the railway station and passing through the iron bridge at Kiang-ngai, and end at Dah-chong-tung.

## WATERWORKS

**Water Supply Projects in Malay Peninsula.**—There is a large project in course of development for bringing water to Singapore from the state of Johore, crossing the Straits of Johore over the Johore Straits causeway, now in course of construction, reports Trade Commissioner John A. Fowler. There is also under consideration a plan for developing a water supply in the state of Kedah. The present financial situation is delaying all public works for which money has not already been appropriated, and it is probable that actual construction will not commence for some time. The mere item of cast-iron piping for both projects will involve upward of a million dollars, and, while the call for tenders on this piping may be delayed for several years, interested American manufacturers would be well advised to watch developments, as the government is not apt to allow much time for submitting bids when tenders are invited.

**Water Supply Company, Canton.**—The *Canton Times* is informed by Mr. J. Ormistang, engineer in charge of the Anglo-Chinese Engineers' Association, Ltd., that the complete new plant for the Water Supply Company was landed in Hongkong in the early part of this month. This include one pump only.

**Extension of Shanghai Native Waterworks Co.**—The Shanghai Native Waterworks Co. has completed the installation of large pipes from Dah-nan-men to Sin-pei-men; and a similar work from the site of the company to the suburb of Nan-men will be carried out soon. It is reported that the company has ordered from abroad an up-to-date pumping machine which will arrive in Shanghai in October.

**Capitalization of the Proposed Nanking Waterworks.**—At a meeting held at the Nanking municipal council on September 12 under the chairmanship of Mr. Liu, general-staff of the Kiangsu tuchun, it was officially decided that the capitalization of the proposed waterworks at Nanking should be \$1,200,000 in 60,000 shares of \$20 each.

## WIRELESS

**China's Wireless Station.**—A greater part of the wireless stations established in China are owned by foreigners, those owned by the ministry of communications being only eight in number. They are in Peking, Kalgan, Wuchang, Foochow, Woosung, Canton, Zungming and Shanghai. Besides these, there are three others belonging to the ministry of war established in Peking, Tientsin and Paoting, while another controlled by the ministry of navy at Tungchow has not been opened to service yet.